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ABSTRACT

The teacher's guide accompanies nine instructional modules on environmental education which are designed as supplementary material for a primary level social studies program. The modules focus on teaching/learning activities that will build on understanding of the interrelationships between man and the land, water, and air. A major objective is to have the students deal realistically with the environment. Emphasis is given to the thinking processes of young children and the provision for many opportunities to engage in creative thinking. Each instructional module (1) lists all required materials; (2) provides 10-15 learning experiences organized with a statement of content, required material, behavioral objectives, focusing questions, and overview; and (3) suggests supplementary experiences. The teacher's guide describes and illustrates teaching strategies based on three cognitive tasks--concept formation, interpretation of data, and application of principles--and on productive-divergent thinking behaviors. Additional suggestions for using the modules, a rationale for involving the community, and a final evaluation instrument are also included. (Author/JH)

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PRIMARY ENVIRONMENTAL EDUCATION PROJECT

University of Georgia
Athens, Georgia

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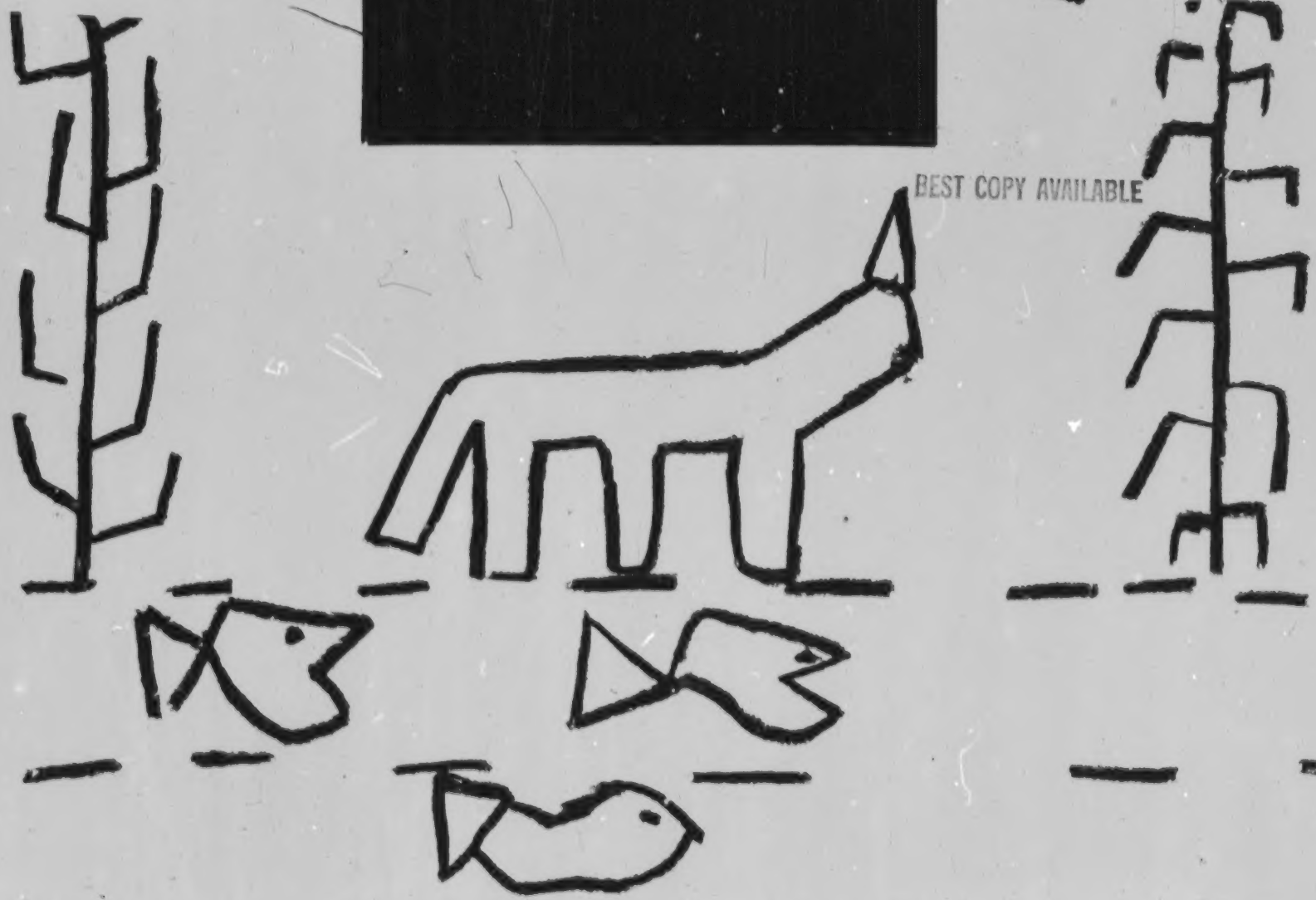

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TEACHER'S GUIDE

PRIMARY ENVIRONMENTAL EDUCATION PROJECT

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Preface

The purpose of the Primary Environmental Education Project of the University of Georgia was to develop and field test nine instructional modules designed as supplementary material for a primary level social studies program. The modules focus on teaching/learning activities that will build an understanding of the interrelationships between man and the land, water, and air. In the construction of the modules primary emphasis was given to the thinking processes of young children and the provision for many opportunities to engage in creative thinking.

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Cover design by Sherri Hardeman, a primary level pupil at Oconee Street Elementary School, Athens, Georgia.

FOREWORD

The Primary Environmental Education Project was conceived as an effort to bring to the primary elementary school child an opportunity to deal realistically with the environment.

In our attempt to fulfill this objective, we have developed a curriculum program that can be used as a series of supplementary activities or as a point of departure for an integrated program of social studies and science. Instructional experiences were constructed to also include music, art, and language arts activities considered applicable for this age group. Although the environmental quality problems considered in this program focus on the Athens, Georgia, area, the nature of such problems is generalizable to most any community of the nation.

It is our belief that the program can generate an enthusiasm on the part of child, parent, and teacher for learning about man-land, man-water, and man-air relationships in the context of one's own community.

We hope these modules will serve as a stimulus for many creative, productive learning experiences in primary level classrooms as we work toward an environmentally literate citizenry.

Everett T. Keach, Jr.

Elmer D. Williams

Co-Directors

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I. INTRODUCTION AND RATIONALE

Today's young children learn about environmental crises from several sources. They watch television, listen to the radio, see pictures in newspapers and magazines, and hear their parents and others talking about how the environment is being spoiled by man. Unfortunately, most of their information input from the media is at the factual level of "this is what happened and where it happened." At school, environmental education curricula in the primary grades are, for the most part, an uncoordinated set of activities. A curriculum may consist of an occasional reference to an environmental problem illustrated in one of the school weekly newspapers, sporadic student or teacher observations of an environmental quality problem in the local neighborhood and community, or, at best, a series of activities drawn from the areas of conservation or outdoor education which are primarily awareness-oriented. At present, few materials are being utilized effectively to teach primary level children to go beyond the level of "what-where" and to develop a broader understanding of the components of man's environment, the interrelationships among those components, and the potential consequences of man's actions.

This lack of instructional materials for use with the primary level child is usually rationalized in several ways, including:

1. the absence of a clear conceptual framework to use in developing materials;
2. the apparent lack of time in the school day to instruct in the area of environmental education;
3. the difficulty of providing realism in terms of the child's life space; and
4. the lack of funds to develop prototypic materials.

In the spring of 1972, the Primary Environmental Education Project (PEEP) of the University of Georgia was awarded a federal grant from the Office of Environmental Education to develop a series of interdisciplinary environmental education modules that would attempt to overcome the first three concerns above.

The first activity of the PEEP staff was to describe the body of knowledge most applicable to environmental education. To say that environmental education is education for the total environment implies coming to grips with knowledge of the social sciences, the humanities, and the physical and natural sciences. The problems facing those interested in developing programs is one of selection. What

concepts, generalizations and processes are we to extract from these fields of knowledge which will have the widest applicability for the individual? Although several suggestions for the curriculum developer have been forwarded by the National Environmental Education Development (NEED) Program and others, the need still remains for more clarity in delineating those concepts, generalizations, and processes to be included in a viable environmental education program.

Unless specific cognitive goals are delineated by those representing the knowledge base, program development will be haphazard--and possibly uninviting-- for the educator. Tradition-encrusted subject matter area specialists need to have reassurance from experts in their respective disciplines that there, indeed, is a need to approach environmental education from an interdisciplinary perspective. This reassurance needs to be documented with a conceptual frame of reference that cuts across subject matter divisions usually found in the public schools. PEEP utilized consultants from the University of Georgia Institute of Ecology, Department of Science Education, and Department of Social Science Education in determining the content (concepts and generalizations) appropriate for study at this age level. Once content had been selected by subject matter specialists, the Project Associates, Project Teachers, and primary classroom teachers studied that content and advised the PEEP staff on its suitability for their age level pupils.

Content of the modules was developed using two strands: thematic and conceptual. Thematic strands were man-land, man-water, and man-air relationships. At each of the three age levels all three thematic strands are studied. Conceptual strands consist of support systems, pollution, and management. Each age level focuses on one conceptual strand. The modules for six-year-olds utilize the support systems conceptual strand, modules for seven-year-olds focus on pollution, and modules for eight-year-olds concern how man manages his environment. Table A presents a listing of instructional modules developed by PEEP and their thematic and conceptual strands. The reader will note that the number in the module title represents the age level for which the module was developed and the conceptual strand utilized; the letter in the module title stands for the thematic strand.

In addition to the need for clarity in the identification of concepts to be taught in environmental education programs, attention must be given to structuring a program that is action-oriented. Many of the programs being taught today are "awareness-oriented." To make people aware of the happenings in their environment it is a necessary first step. The ultimate goal, however, ought to be the development of a commitment to work toward the removal of conditions which are detrimental

TABLE A

Instructional Modules Developed by PEEP and Their Thematic and Conceptual Strands

Modules	Thematic Strand	Conceptual Strand
Six-Year-Olds		
1A Support for Man's Activities - A Look at the Land	Land	Support System
1B Water - Support for Man's Activities	Water	Support System
1C Air - Support for Man's Activities	Air	Support System
Seven-Year-Olds		
2A Solid Waste Disposal	Land	Pollution
2B Water Pollution	Water	Pollution
2C Air Pollution - A Threat to Mankind	Air	Pollution
Eight-Year-Olds		
3A Interdependence in the Environment	Land	Management
3B Management of Water Resources	Water	Management
3C Protecting our Air Resources	Air	Management

to the man-environment relationship. Most of the student activities being described in conferences, seminars, and the literature consist of exercises in awareness. Many student projects do not carry forth their tentative findings for additional testing and refinement. Their projects do not incorporate an action component which would move student activities from the classroom to the environment outside the school. The point to be made is that, in the absence of a structure of activities leading from the "awareness" to the "action" stage, much of the effectiveness of an environmental program is lost. Yet, the need for environmental education programs is always couched in terms of educating an individual who will not only be aware of the need for a quality environment but will also be motivated to demonstrate a commitment to improve his social and physical environment. Whenever feasible, "action" learning experiences were included in the instructional sequence.

A third area that needs to be considered in developing a sound conceptual framework is that of skill development. Perhaps this area should have been included in the previous comments, for skills such as critical thinking, productive-divergent thinking, etc., are intertwined in a curriculum that is action-oriented. Environmental education curricula should provide the teacher with the strategies for developing these skills in their pupils. If we ignore this dimension of the curriculum, we will be placing severe restrictions on future generations' abilities to cope effectively and efficiently with environmental problems. As the complexity of managing and improving our total environment unfolds, we can see the need for people who have an ability to think fluently and originally about the man-environment complex. Not knowing the specific dimensions of maintaining a quality environment in the future, we must prepare our children with the ability to think productively and divergently to assist them in their acquisition of a new awareness and understanding of man's relationship with his environment. The instructional strategies around which the PEEP curriculum was developed in order to meet this need are presented in the next section of this manual.

In the primary grades another obstacle becomes apparent when discussions center upon implementing an environmental education curriculum. Most lower elementary school programs are structured to the extent that there is little time left for teaching in such areas as social studies, science, and the fine arts after the teaching objectives have been reached in areas such as reading, mathematics, and writing. Implementing an environmental education program at this level requires (1) devising ways to relate key ecological and environmental management concepts

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and generalizations with those ideas associated with viable social studies and science programs, (2) developing problem-solving skills that clearly reinforce language arts, music and art curricula in the environmental education program. Learning activities of the PEEP modules were designed with the above three criteria in mind. Consultants from the University of Georgia Departments of Language Arts, Science, and Social Studies Education helped the project staff see how their subject areas could be incorporated in the program. In addition, learning experiences that required little or no reading ability were developed since the project staff felt that reading ability should not be the primary factor in whether or not a pupil could learn environmental concepts.

In an attempt to make the materials real in terms of the child's life space, case studies of environmental problems in the Athens-Clarke County area were selected with the help of residents of the Athens Model Cities community. Instead of utilizing case studies that were general and national in character, these materials had children examining problems around their own homes, schools, and community. Action projects had students attempting to better their "own" environments.

The next section will present and describe the instructional strategies that teachers will be utilizing when using these modules in their classrooms.

II. INSTRUCTIONAL STRATEGIES

Teachers have many objectives to accomplish, some immediate, others long-range. In spite of specific variations, we can probably say that the major teaching objectives are:

1. Knowledge - the body of content in curriculum areas;
2. Cognitive skills - the thought processes that are developed and refined;
3. Social skills - the ability to listen and learn from others, group sharing, etc.
4. Attitudes - a wholesome respect for self and others, an openness to further learning, etc.

These objectives are worthy, but daily achievement is a challenge. It is impossible to compartmentalize efforts; they must be achieved simultaneously by the two major means open to every teacher - content and process. Content means what we teach, often spelled out for us in syllabi, guides, textbook series, etc. But content can only accomplish one objective - knowledge. Content does not of itself develop cognitive skills, social skills, or attitudes. These are the result of process, how we teach the content. Only when teachers clearly understand the thinking skills involved in developing concepts, concluding, and generalizing will they make the consistent effort to ask the kinds of questions that will elicit these skills.

The questions that have been suggested in the modules for your use have been carefully formulated to elicit higher level thinking and, also, to be open. Open questions are those which allow for a variety of responses rather than a mere yes or no; e.g., "Can you tell me which plant is the healthiest?" "Yes, I can!" or "No, I can't!" Rephrased in an open way we could ask, "Which of these plants do you think is the healthiest?" This question invites thinking by a group, not just one individual, because there are a number of possible responses. There could be many student responses to one teacher question rather than many teacher questions to elicit one student response. The general effect is that more is heard from students. This approach visibly affects social skills and, possibly, attitudes.

If we are to achieve multiple objectives as frequently as possible within given lessons, we must plan accordingly. It is necessary to plan for both content and process. The age-old questions teachers have asked of themselves are still valid. 1. What shall I teach? 2. How shall I teach it?

The "what shall I teach," or content, of this instructional program was cooperatively planned by representatives of the University of Georgia's Institute of Ecology, Department of Social Science Education, Department of Science Education, classroom teachers of the Clarke County School System and members of community organizations concerned about environmental problems.

The "how shall I teach it," or process dimension of the program is a synthesis of two strategies: the three cognitive tasks originally proposed by the late Hilda Taba (the primary instructional strategies) and productive-divergent thinking behaviors enumerated by the National Schools Project (the secondary instructional strategies).

The Primary Instructional Strategies

The primary instructional strategies are presented in Model One on page 8. These strategies form the basis for planning the sequence of activities of the module and for delineating the steps in the teaching/learning of the learning experience sequences constructed. Thus, the first learning experience of a module would focus on the process of concept diagnosis; that is, finding out what children already know about concepts to be taught in the module, discovering what false information or misconceptions they possess, etc. The next series of learning experiences would be designed to have children interpret various case studies of environmental problems in their life-space (Clarke County, Georgia) and then generalize from that data. Modules conclude with learning experiences that require pupils to apply learnings from the module to new situations. Many of these learning experiences are "action-oriented" to enable pupils to apply learnings by doing.

Each of these three primary instructional strategies of concept formation, interpretation of data, and application of knowledge are described in much more detail in the next several pages. Sample lessons taken from various modules of this program are included to illustrate the theory of the primary instructional strategies applied to daily planning.

MODEL ONE

Taba Cognitive Tasks[1]

Cognitive Task 1. Concept Formation. This involves organizing unorganized information by

1. Enumerating and listing
2. Identifying common properties, abstracting
3. Labeling and categorizing

Cognitive Task 2. Interpretation of Data. This involves forming generalizations or using inductive reasoning by

1. Identifying points, examining similar aspects of topics
2. Explaining items of identified information, comparing and contrasting
3. Forming inferences, implications

Cognitive Task 3. Application of Principles

1. Predicting consequences, hypothesizing
2. Explaining and supporting the predictions or hypotheses
3. Verifying the prediction or hypotheses

[1]Hilda Taba, Teacher's Handbook for Elementary Social Studies (Palo Alto, Calif.: Addison-Wesley Publishing Co., 1967), pp. 91-117.

Concept Formation

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If we look upon content as specific facts, then, which ones do we choose? Most of us try to teach that which is important, relevant, and transferable. For facts to have meaning they must be organized into basic concepts. Concepts give us the focus around which we plan factual content. They provide us with the means of organizing and synthesizing knowledge. We do not have to teach it all, but we choose among the myriad of facts those which will best serve the purpose. Long after the facts have become obsolete the concepts will still be valuable.

Most experienced teachers will find very little in education which is new. However, the systematic organization of content into concepts and of teaching into a cognitive-structured activity is quite different. It is these which give teachers the opportunity to unify the day's activities and tie them all into a lesson purpose which will achieve many objectives.

There are many definitions of concept. The dictionary tells us it is a generalized idea of a class of objects. Others describe it as a name or label for an accumulation of specific items which have some common attributes. This could mean the label "apple" for red, round, hard, sweet, pits, etc. or the more inclusive idea of fruit, food, edibles, etc. Regardless of which definition you choose, it is generally accepted that concepts depend upon the recognition of commonality, the discrimination of critical attributes, and the synthesis of a variety of impressions.

Throughout the PEEP materials, consistent attention has been given to the numerous cognitive skills involved in the development of concepts. Because sense impressions provide children with the data for concepts, students are given many opportunities for concrete experiences. Processing these experiences, they are asked to observe, note differences, similarities, order, group, etc. The following is a list of processes frequently used and the role they play in bringing the child to the formulation of concepts.

Behavioral Objectives	Rationale for Process Cognitive Objectives	Focusing Questions
Listing data Enumerating data	Observing	What do you see, hear, feel, etc? What do you notice?
Listing data Enumerating data	Recalling Differentiating	What do you remember about ____?
Stating differences between two or more things.	Isolating different characteristics.	What is one way they are different from each other?
Stating similarities between two or more things.	Isolating common characteristics.	What is one way there are alike?
Ordering data	Recognizing degrees of difference among particular attributes.	Which of these would you consider the most important?
Grouping Giving reasons for grouping	Noting common characteristics. Identifying those characteristics.	Which of these could we put together because they are alike in some way? What is it about them that is alike?
Labeling groups Giving reasons	Synthesizing the commonality by a category name. Supporting the appropriateness of the label.	What could we call things that are alike in this way? What makes that an appropriate name?

Classifying	Subsuming specific bits of data under category names. (Requires knowledge of the category label and attributes of subsumed data).	What other things might be called "living things?"
Testing	Distinguishing critical from non-critical attributes.	If we tear off one of the corners, would this still be a triangle?

Concept development requires a multiplicity of experiences and a chance to interact cognitively with those experiences. That interaction and meaningful verbalization can be brought about by skillful questioning. Although the skills are sequential in order of difficulty, there is no one order in which one must use them. Children might be asked to observe and recall frequently before grouping or noting similarities, etc. Only frequent and consistent use of all the skills can insure concept formation, clarification, and extension.

Sample Concept Formation Lesson

(Taken from Instructional Module 2A - Solid Waste Disposal)

Content: Garbage is everything we don't want or use.
Process: Observing, recalling, grouping, labeling.
Materials: Unwanted contents of pupils' and teacher's desks, chart paper.

Behavioral Objectives	Focusing Questions	Anticipated Responses
Students will list items that have been thrown away.	What are some of the things that you see here that we are throwing away?	Used drawing paper, short pencils, broken pens, paper clips, graded assignments, broken pencils, notebook covers, shavings from pencil-sharpener, milk cartons, orange

		peelings, old crayons, cardboard boxes, empty paste jar, used staples.
Students will group items of garbage on the basis of common characteristics and give reasons for their groupings.	Which of these things we are throwing away could we put together because they are alike in some way? Why are they alike?	1. used drawing paper, graded assignments, notebook covers, milk cartons, cardboard boxes. 2. used staples, paper clips. 3. short pencils, broken pencils. 4. empty paste jar etc.
Students will label groups they made and give reasons for the labels.	What name could we give this pile? Why do you think that is a good name?	1. Paper 2. Metal 3. Wood 4. Glass Etc.
As new examples of garbage are given, students will decide in which category they belong and give reasons for their classifications.	Which of our groups would you put _____ in? Why do you think it would go in that group?	Paper towels - paper catsup bottle - glass, metal pop can - metal broken toy - wood

Interpretation of Data

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A generalization may be called a statement of relationship among concepts. Then, in order to generalize knowledge and to apply that knowledge to other situations, there are a number of prerequisites. There must be a broad variety of experiences already organized into concepts and these must be processed and interpreted in terms of their relationship to one another. At the heart of this process is the understanding of cause and effect. The thinking tasks become more complex when we ask children to compare, contrast, infer causes and effects, draw conclusions, or make even simple generalizations. These cognitive tasks demand that the child go beyond what is directly given. He is working now not only with the raw data but with his own interpretation of the data -- a good reason for the teacher asking students to give reasons for the inferences they state. Only with careful planning will the teacher avoid the two extremes: 1) expecting conclusions or generalizations without sufficient experiences which enable the child to make them and, 2) underestimating the worth of "supposedly simple" statements he makes. The following skills are involved in the formation of conclusions and generalizations.

Behavioral Objectives	Cognitive Objectives	Focusing Questions
Listing data Enumerating data	Observing	What do you see, hear, feel, etc.? What do you notice?
Listing data Enumerating data	Recalling Differentiating	What do you remember about ____?
Stating inferred causes of data State reasons for inferences	Inferring cause-effect relationship from data supporting inferences	What are some reasons why we have rules in our school? What makes you think so?
Stating inferred effects of data	Inferring cause-effect relationship from data	What happens because we have a rule about being on time for school?

Stating reasons for inferences	Supporting inferences	In what way is that an effect of the rule?
Stating conclusions	Synthesizing a variety of ideas	From all that we have said, what would you conclude are the reasons why we have rules in our school?
Stating reasons for conclusion.	Identifying the basis for the conclusion	What leads you to think so?
Making general statements	Generalizing from known to other like situations	What could you say generally about the reasons for school rules?
Stating reasons	Supporting general statements	Why do you think that would be true?

In addition to the skills involved in arriving at logical, warranted conclusions and generalizations, there are those which depend on generalized knowledge. In order to anticipate or to make choices, we rely upon knowledge gleaned from our past experiences. The greater our knowledge, the greater chance we have to anticipate accurately and to make good choices.

Sample Interpretation of Data Lesson

(Taken from Instructional Module 1A - Support for Man's Activities: A Look at the Land)

Content: Man uses land to have fun. Limitations of land limit types of fun.
Process: Observation, transfer to art form, inferring causes, concluding.
Materials: Pictures of a variety of types of recreation, art paper, crayons, tape.

Behavioral Objectives	Focusing Questions	Anticipated Responses
Students will observe each picture and tell what is happening in each.	What do you see happening in this picture?	People skiing, bike riding, on the beach, playing football, etc.

Behavioral Objectives	Focusing Questions	Anticipated Responses
Students will state which picture is the most fun. Students will state reasons they consider the pictures the most fun.	Which of the pictures do you think would be the most fun for you? Why do you think _____ is the most fun?	Reasons: Skiing - I love snow. Football - because it's rough. Beach - you can build castles.
Students will draw pictures of their favorite activity putting themselves into the picture.	Draw your own picture of the one which is the most fun and put yourself into the picture.	Various responses
Students will display pictures pointing out their place in the picture.	When you bring your picture to the bulletin board, show the class where you are in the picture.	Various responses
Students will observe pictures and state whether or not that recreation is available in Athens. Students will state reasons why activity is available or not available.	Looking at the things people are doing in this picture, could we have this kind of fun around here? Why could we have football? Why can't we go skiing? Why can we have horseback riding?	Football - because we have space and people. Beach - no, we have no lake or ocean. Skiing - no, we have no snow, mountains, etc.
Students will state what they would have to do to make it possible.	What would we have to do if we wanted to have a beach in Athens? ... if we wanted to ski?	Dig out land - fill it with water - bring in sand. Raise land to make mountains - make artificial snow, etc.

Behavioral Objectives	Focusing Questions	Anticipated Responses
Students will state conclusions about the effects of land on types of recreation.	We've been talking about some kinds of fun people have on land. You said there are some kinds we could have. What were the reasons why we could have them here?	Concluding statements may come here. If not, pursue further.
	What were some of the kinds other people have that we don't have here? What were the reasons why we can't have them?	Land isn't right for some kinds of fun. You can only have some kinds of fun when you have mountains, oceans, etc.

Many interpretation of data lessons will utilize information obtained from study trips, experiments, graphic materials, and experiences of the children. These are largely cognitive experiences. However, the classroom teacher must not neglect another very important source of data for interpretation, analysis and clarification by students. These are the feelings and values of the children they teach. In the process of the interpretation of values students will often use the skills of identifying problems, proposing solutions to problems, identifying possible consequences of various solutions, stating feelings, and making choices. While valuing lessons also ask the child to use cognitive skills, they are generally classified as being in the affective domain. A sample lesson that illustrates a strategy for interpreting the feelings or values of children is provided on the next page.

Sample Interpretation of Data (Valuing) Lesson
(Taken from Instructional Module 1A - Support for Man's Activities - A Look at the Land)

Content: When people don't use traffic patterns, problems come up.
Process: Recalling, inferring, proposing alternatives, testing solutions.
Materials: Picture of woman angry at trespassers, other pictures of traffic patterns being followed and ignored.

Behavioral Objectives	Focusing Questions
Children will:	
Identify items in a picture.	What are some of the things you see happening in this picture? What do you think the boys are doing? Where do you think this is?
State inferences about feelings of Mrs. Johnson.	How do you think she is feeling? (Angry)
Give reasons to support their inferences.	Why might she be angry? (or any other feeling they mention)
State inferences about feelings of children in the picture.	How do you think the boys are feeling?
Give reasons to support their inferences.	What makes you think so? Why would they feel that way?
Propose solutions to the problem.	What could Mrs. Johnson do to make this a better situation? (Get a few ideas.) Why would this be a good idea?
Test their solutions in role-playing situations.	If you were Mrs. Johnson, what might you be saying and doing? If you were the children, what do you think they would be saying and doing? (for each role play).

Application of Knowledge

Once having developed concepts and related them to each other by interpretation, we try to provide children with as many opportunities as possible to apply what they have learned to new or different situations. The child learns that there are instances when his general knowledge does not hold true for a new situation. When it does not, he is forced to modify or extend his ideas accordingly. Another case of application of knowledge is in the process of making choices. The choice for or against something is generally based upon his past experience. In any case, there are numerous opportunities to help the child use the knowledge he has acquired and these should be incorporated into the teaching day on a consistent basis. The following skills help children apply knowledge:

Behavioral Objective	Cognitive Objective	Focusing Questions
Asking questions about a new or changed situation.	Identifying what information would be needed to understand new situation.	From what you already know about things like these, what questions could you ask about it?
Stating predictions about a new situation.	Anticipating consequences of a given situation.	What might happen if...?
Stating reasons for predictions.	Supporting prediction from prior knowledge.	Why do you think _____ would happen?
Stating conditions necessary for predictions to occur.	Identifying reasons.	What else would have to be true for that to happen?
Stating reasons.	Supporting conditions with reasons.	Why would that have to happen?

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Behavioral Objectives	Cognitive Objective	Focusing Questions
Making choices on the basis of given criteria.	Comparing attributes of alternatives with criteria.	Which of these would be best if ____? Which would you choose for _____?
Stating reasons for choices.	Identifying reasons for choices.	Why do you think that is the best?

Sample Application of Knowledge Lesson
(Taken from Instructional Module 1A - Support for Man's Activities - A Look at the Land)

Content: People must recognize land problems and make decisions about them.
Process: Recalling, identifying problems, choosing, ordering, acting.
Materials: Playground, large paper mounted on cardboard, felt pen or crayon (for drawing map).

Behavioral Objectives	Focusing Questions
Children will:	
Tell what they remember about a previous picture activity.	What do you remember about the lesson with the pictures of traffic problems? What were we looking for in the pictures?
Identify problem areas in the schoolgrounds.	What are some problems you notice on the schoolgrounds?
Explain why they think it is a problem.	Why do you think that is a problem?
List problems they found.	What are some of the problems we marked on our map?
Discuss in groups of five what they could do to solve the problem.	What are some things you could do to solve the problem?

Behavioral Objectives	Focusing Questions
Report their discussions.	What has your group decided? What made you decide on that? (Allow others in the group to contribute here.)
Select the problem that most needs to be worked on.	Which of these problems do you think needs our help most?
List the things that have to be done.	What will we have to do to help?
Order the listing of things to be done according to what should be done first, second, etc.	Let's look at the things we'll have to do. Think about them for a minute and decide which should be the first thing we do.
State reasons for order.	Why should we do that first? What should we do next?

The Secondary Instructional Strategies

Learning experiences of the modules were designed around classroom strategies for the development of productive-divergent thinking behaviors (National Schools Project). Model Two on page 22 illustrates the three dimensions of teaching productive-divergent thinking through subject matter content. The purpose of incorporating productive-divergent thinking behaviors into the primary instructional strategies was to build into the modules those secondary teaching strategies that result in fluency, flexibility, originality, and elaboration in pupils' thinking as they study and analyze local environmental quality problems. Some characteristics of these productive-divergent thinking behaviors are given below:

I. Fluent Thinking
   Generation of a quantity
   Flow of thought
   Number of relevant responses
   Ability to produce the most in a given time

II. Flexible Thinking
   Number of different approaches
   Variety of kinds of ideas
   Ability to shift categories
   Versatility to change in focus

III. Original Thinking
   Unusual responses
   Clever ideas
   Novel but relevant approaches
   Production away from the obvious

IV. Elaborative Thinking
   Embellishing upon an idea
   Add necessary details to work out a new thought
   Production of detailed steps
   Embroider upon a simple idea or response to make it more elegant

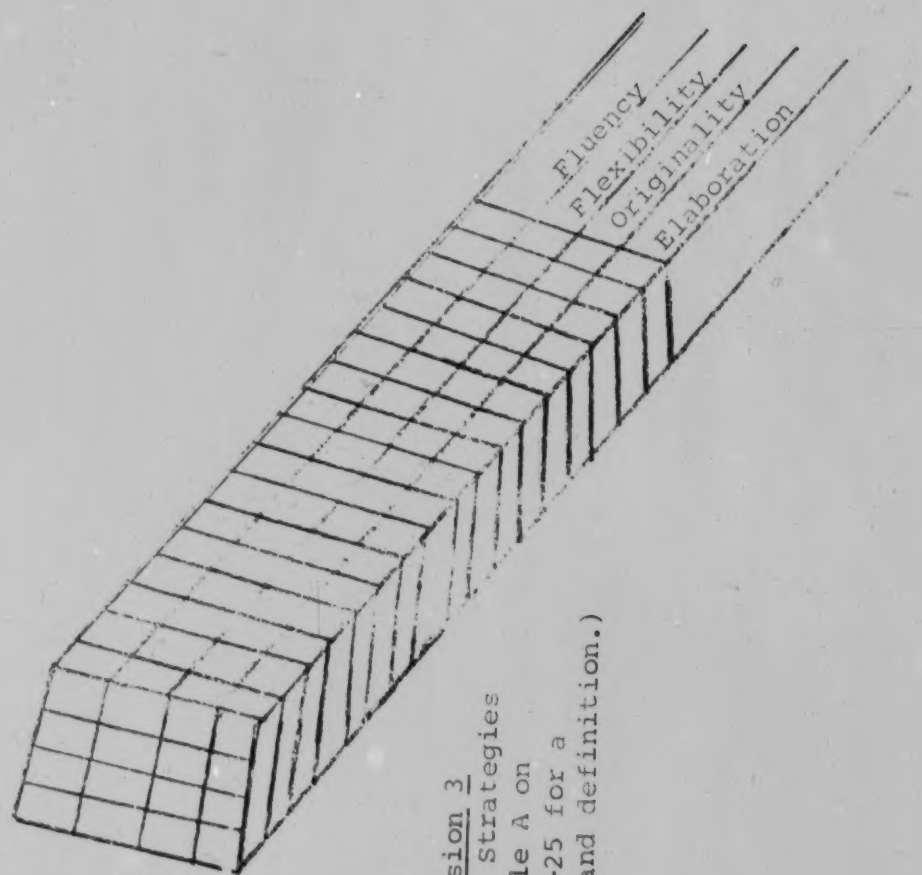
Teaching strategies to elicit these thinking behaviors are named and described in Table A.

[2]Classroom Ideas for Developing Productive-Divergent Thinking, National Schools Project, Macalester College, St. Paul, Minnesota, 1966.

MODEL TWO

Teaching Productive-Divergent Thinking Through Subject Matter Content

Dimension 3
Productive-Divergent
Thinking Behaviors



Dimension 1
Subject Matter
Content

1. Social Studies
2. Science
3. Language Arts
4. Music - Art

Dimension 2
Teaching Strategies
(See Table A on
pages 23-25 for a
listing and definition.)

TABLE B

Teaching Strategies to Elicit
Productive-Divergent Thinking

NAME	MEANING
No. 1 - Paradoxes	Situation opposed to common sense Self-contradictory statement or observation
No. 2 - Analogies	Situations of likeness Similarities between things
No. 3 - Sensing Deficiencies	Gaps in knowledge Missing links in information
No. 4 - Thinking or Possibles	Guessing or forming hypotheses Thinking of probabilities
No. 5 - Provocative Questions	Inquiry to bring forth meaning Incite knowledge exploration
No. 6 - Attribute Listing	Inherent properties Conventional symbols or identities
No. 7 - Exploring Mystery of Things	Detective work on unfamiliar knowledge Examine unnatural phenomena
No. 8 - Reinforcing Originality	Rewarding original thinking Strengthen unlikely but relevant responses
No. 9 - Examples of Change	Demonstrate the dynamics of things Provide opportunities for making alterations, modifications, or substitutions

No. 10 - Organized Random Search	Use a familiar structure to lead at random to another structure Case studies from which new courses of action are devised
No. 11 - Examples of Habit	Discuss the effects of habit-bound thinking Build a sensitivity against rigidity in ideas
No. 12 - Skills of Search	Consider ways something has been done before Trial and error on new ways Control experimental conditions
No. 13 - Tolerance for Ambiguity	Provide encounters which challenge thinking Pose open-ended situations
No. 14 - Intuitive Expression	Skill of expressing emotion Feeling about things through all of the senses
No. 15 - Process of Invention	Steps of problem-solving leading to invention Study the incubation process leading to insight
No. 16 - Adjustment to Development	Examine how failures, or accidents, have paid off Learn how to learn from mistakes
No. 17 - Study Creative People	Analyze traits of eminently creative people Study the process which has led to creation
No. 18 - Interact with Past Knowledge	Nurture ideas from previously stored knowledge Allow opportunities to toy with information already acquired

No. 19 - Evaluate Situations	Extrapolate from the results of ideas and actions Deciding upon solutions in terms of their consequences and implications
No. 20 - Receptive to Surprise	Capitalize upon unexpected ideas Alert to the significance of novel thoughts
No. 21 - Creative Reading Skill	Learn the skill of idea generation by reading Develop a utilitarian mind-set for information
No. 22 - Creative Listening Skill	Learn the skill of idea generation by listening Listen for information which allows one thing to lead to another
No. 23 - Visualization Skill	Express ideas in three-dimensional forms Practice describing views from unaccustomed vantage points

Taken from Classroom Ideas for Developing Productive-Divergent Thinking, 1966.

Planning for Content and Process

Questions to Ask:

1. What is the purpose of the lesson (in relation to long-range goals as well as immediate ones)? e.g., a lesson might be on the use of the ruler or yardstick, but it is all part of the concept of measurement.

2. What materials or experiences are appropriate and available (according to the needs and the interests of the children, as well as of the content purpose)?

3. What teaching activities will follow the experience or use of materials? It is a mistake to assume that because children have seen a film, handled objects, heard a story, or taken a trip to the park that they have necessarily formed concepts or even done any thinking at all. At this point, questioning becomes extremely important to induce certain cognitive processes as well as to provide an opportunity for social interaction.

4. How will the children respond? Well-planned lessons have gone astray because they failed to take into account the children involved. Anticipating responses makes the achievement of purpose more probable because problems can be foreseen. The reader will note that several of the sample lessons illustrative of different instructional strategies included some anticipated responses of pupils.

5. How can I be sure the purpose was accomplished? Specific behavioral objectives make possible an immediate evaluation of overt objectives. From these objectives the knowledge and skills objectives of the lesson or module can be inferred by the teacher. Some behavioral objectives should be stated in ways that the teacher may also examine the social skill and attitudinal development of the children.

General Procedures for Using the PEEP Instructional Modules

Before teaching lessons from the PEEP modules, you should:

1. Quickly read through all the modules you plan to use in your environmental education program. By doing this you will find out how the different modules for a given age level fit together.

2. Select the module you will begin with and study the module generalization. This represents the main idea that you will expect children to understand.

3. Read each "Learning Experience" of the module in order to get an overview of the sequence of lessons and the wide range of thinking skills you will be expecting children to use.

4. Collect all the needed materials. A "Required Materials" page has been included at the beginning of every module to help you collect and organize the materials you will need for the study.

5. Before teaching each lesson read carefully the "Learning Experience." This is a description of the teacher activity. Then examine carefully the "Behavioral Objectives" and "Focusing Questions" given for the lesson. The behavioral objectives will help you keep clearly in mind the behaviors expected of the children. Focusing questions are designed to elicit those behaviors. It should be remembered, however, that these do not necessarily represent all the questions that will be asked during the lesson. They are the questions that will focus children on the most important objectives of the lesson.

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III. INVOLVEMENT OF COMMUNITY

An important procedure to follow early in the development of an environmental education program is to establish a group which will be charged with the development and evaluation of the program. In addition to school personnel, this group should include community representatives.

In order to provide mechanisms for the maximum involvement of the community, the committee must include citizens who have an interest in environmental quality problems. It should be noted that every community has interest groups which work toward improving the social, physical, and biotic conditions in man's environment. Furthermore, this coordinating committee should have some members who are parents of the children involved in the environmental education effort. This provides an important mechanism for strengthening curriculum development activities.

Two important assumptions underly this consideration. First, it is felt that more realistic teaching-learning situations and materials can be provided for the child if the parents are involved in the identification of content vehicles to be utilized in teaching environmental management concepts and generalizations. Parents who are aware of environmental needs in their home and neighborhood settings are of inestimable value in helping select content for the curriculum. Secondly, the utilization of parents represents a realistic approach to a home-school partnership that can strengthen the bond between the family and the educational establishment. In the normal course of the school year, there are many opportunities for the parents to reinforce ideas and skills being developed in the classroom. Parents can, in effect, assist more naturally in the teaching-learning process as they interact with their children in the context of the home.

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The identification of interested individuals in any community is a relatively simple task. Interest in environmental problems has quickened in recent years to the extent that individuals and groups have formed in every community to publicize and/or combat mismanagement of the environment. As many of the groups represent the middle socio-economic stratum of the community, care should be taken in the selection of committee members in order to obtain representation of the total community.

In the Primary Environmental Education Project, the Athens Model Cities Program personnel were helpful in identifying environmental concerns of residents in public

housing areas. Parents involved in the Model Cities "Green Thumb" project assisted in identifying case studies in these areas that might be selected for the curriculum.

The next phase of parental involvement in the Primary Environmental Education Project, other than traditional involvement in organizations such as the PTA, was planned by the manner in which some of the child's learning experiences were structured. In the modules there are learning experiences that involve the home or the neighborhood. Whether it be data collecting or an action project to improve the home or neighborhood environment, an attempt was made to involve parents and other adults in the child's social environment. Parents were asked to help in data collecting or in providing materials usually found around the home. This type of parent involvement coupled with the usual school-community system of communication (PTA, special events, etc.) served as a continuing source of feedback during the project.

The culmination of project activities was publicized by the local news media. In one news feature, community groups who had worked with the project were acknowledged with the same plaudits from the feature writer as the school's instructional staff. This seemed to further strengthen community involvement. Following the news feature, parents from schools not involved in the project inquired about the program for their children. In addition, several new environmentally-concerned groups volunteered to serve as resources for the program.

Throughout the development of an environmental education curriculum, frequent opportunities should be sought for members of the development committee to discuss and demonstrate aspects of the project. Most helpful for acquainting the business community with project activities are presentations made to service organizations such as Kiwanis, Lions, Civitan, etc. Most, if not all, of these organizations now have an "environment committee."

In summary, the involvement of representatives of the total community is essential for the successful development, implementation and evaluation of an environmental education curriculum.

The following national organizations are representatives of those that serve as resources for an environmental education program, quite often through their local or regional offices:

Conservation Foundation
1250 Connecticut Avenue, N. W.
Washington, D. C. 20036

National Audubon Society
1130 Fifth Avenue
New York, New York 10028

Nature Conservancy
1522 K Street, N. W.
Washington, D. C. 20006

Friends of the Earth
30 E 42nd Street
New York, New York 10017

The National Wildlife Federation
1412 16th Street, N. W.
Washington, D. C. 20036

Sierra Club
1050 Mills Tower
San Francisco, California 94104

IV. EVALUATION

Formative

During the development and implementation of the instructional modules, informal provisions were made for weekly feedback from the supervisors, teachers, and teacher corps interns involved directly and indirectly with the curriculum. This feedback was particularly valuable during the term of the project as it represented comments from the Model Cities community. This occurred because the interns in the Athens Teacher Corps Project lived in the Model Cities areas served by the Oglethorpe Avenue and Oconee Street Schools, two of the project's schools.

Formal provisions for feedback were provided by the mechanism of released time for the Project Associates to work on the modules. During these sessions, time was allotted for a discussion of the strengths and weaknesses of the program as well as the extent to which parents were responding to the activities.

Summative

Final evaluation of PEEP was made on the basis of two instruments. The first, The Torrance Test of Creativity, was chosen to measure the impact of the instruction upon the pupil's ability to engage in productive-divergent thinking. These tests measure the variables of fluency, flexibility, originality, and elaboration in the thinking process. Form B of the Figural Test was administered as this required responses that were mainly drawing or pictorial in nature.

The second instrument, The Primary Environmental Awareness Test (PEAT), was developed to measure retention of the content and concepts contained in the instructional module. Although many of the behaviors of the pupils created by the instruction cannot be measured adequately by a cognitive test, it was felt that some measure of cognition would be helpful in determining the impact of the modules upon pupil performance. It was also felt that a measure of this type would be helpful in determining future modifications of the instructional sequence. The Primary Environmental Awareness Tests administered by the project are presented on pages 32-37.

PRIMARY ENVIRONMENTAL AWARENESS TEST

LEVEL ONE: SIX-YEAR-OLDS

1. Clay and sand are two kinds of soil.
2. Soil can be many colors.
3. Clay and sand feel the same.
4. Plants grow better in some soils.
5. Plants grow better when we put humus in the soil.
6. We can live without land.
7. In our town, we could get along without roads.
8. Some people have fun on land by sailing boats.
9. People can move across land in many ways.
10. People can build houses without land.
11. One way we use water is to drink it.
12. Plants need water to grow.
13. People need water in order to live.
14. Plants grow only in soil.
15. Some of the food we eat comes from water.
16. Water causes dirty air.
17. People use water to clean many kinds of things.
18. Animals would die without water.
19. Apples are the only food with water in them.
20. Water is used for transportation.
21. Air cannot be seen.
22. We can feel air.
23. Air is all around us.
24. The only way seeds can be moved is by man.
25. Moving air makes the body hot.
26. Kites can fly without air.
27. Living things need air in order to live.
28. Air is only good for breathing.
29. Candles need air in order to burn.
30. Storms are moving air.
31. Clay and sand are the same kind of soil.
32. Clay and sand look the same.

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33. Clay and sand feel different.
34. Plants grow the same in all soils.
35. Plants grow worse when we put humus in the soil.
36. Land is important because plants grow in it.
37. In our town people need roads.
38. Some people have fun on land by playing baseball.
39. People can move across the land in just one way.
40. People use land for building houses.
41. We only use water for drinking.
42. Plants can live without water.
43. Man can live without water.
44. Some plants will grow in water.
45. The food we eat comes only from soil.
46. Water cleans the air.
47. People use water to clean just a few things.
48. Some animals can do without water.
49. Many foods have water in them.
50. The only way to get across a lake is by an airplane.
51. We can see air.
52. We can never feel air.
53. Air can be found only in a balloon.
54. The air can move seeds.
55. Moving air makes the body cool.
56. People need air to fly kites.
57. Animals can live without air.
58. People travel by air.
59. Candles can burn without air.
60. Air can never be harmful to people.

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PRIMARY ENVIRONMENTAL AWARENESS TEST

LEVEL TWO: SEVEN-YEAR-OLDS

1. Garbage is everything we don't want or use.
2. The packages that food comes in add to the amount of garbage in our city.
3. There is never much paper in the garbage.
4. Taking left-over foods to the city dump is the best way to get rid of them.
5. It is easier to get rid of garbage if we smash it into a small package.
6. A landfill is one type of solid waste.
7. Most of our garbage ends up at the city dump.
8. We should throw away paper as soon as we use it once.
9. Boys and girls like us can do nothing to help people know about the littering problem.
10. Using empty cans is one way to cut down on the amount of solid waste.
11. People can never use landfills again.
12. Empty bottles can be reused to make useful items.
13. Water is needed by all living things.
14. People are responsible for water pollution.
15. All washing detergents contain the same amount of phosphate.
16. Phosphates clean our water.
17. Polluted water causes the death of water plants and animals.
18. People are never harmed by water pollution.
19. People have ways to take oil out of water.
20. The wastes from factories can cause water pollution.
21. Fish like to swim in water containing pollutants.
22. Water becomes cleaner through filtering.
23. We can be healthy without clean air.
24. There are particles in the air that we can't see.
25. Exhaust gases of cars cause air pollution.
26. The Ringelmann Smoke Chart tells us how many people smoke.
27. There are different amounts of air pollution in the air on different days.
28. Chalk dust is one type of pollutant in the air in our classroom.
29. All cars put the same amount of pollution in the air.
30. When we burn leaves in the yard, we are polluting the air.
31. The sky appears to be gray when there is a lot of pollution.
32. Our air is cleaner after a rain storm.

33. Air pollution helps people.
34. Garbage is everything we need and use.
35. The containers that food comes in lessen the amount of garbage in our city.
36. Garbage usually contains large amounts of paper.
37. We should try to eat left-over foods rather than take them to the city dump.
38. It is harder to get rid of garbage if we smash it into a small package.
39. A landfill is one way in which we handle solid waste.
40. People should dump their garbage in the park.
41. If we reused paper, there would not be so much at the dump.
42. Boys and girls like us can help people to know about the littering problem.
43. When we reuse empty cans we add to the problem of solid waste.
44. We can build playgrounds on land that has been filled in with garbage.
45. Useful items can never be made from empty bottles.
46. We can live without water.
47. People have nothing to do with water pollution.
48. Washing detergents contain different amounts of phosphates.
49. Phosphates cause pollution of water.
50. Polluted water keeps water plants and animals healthy..
51. Water pollution is harmful to the lives of people.
52. There is nothing we can do to get oil slicks off water.
53. Detergents are the only things that pollute water.
54. Clean water is better for fish.
55. We can clean water only by using chemicals.
56. Clean air is needed for good health.
57. Air has nothing in it.
58. Pollution is never caused by auto exhaust.
59. The Ringelmann Smoke Chart shows us how thick and polluting smoke is.
60. Air pollution levels are always the same.
61. Air pollution can only be found outside.
62. Different cars give off different amounts of pollution.
63. Pollution can only be caused by big factories.
64. We know there is a lot of pollution when we see a blue sky.
65. Rain has no effect on the air.
66. Air pollution hurts people.

PRIMARY ENVIRONMENTAL AWARENESS TEST

LEVEL THREE: EIGHT-YEAR-OLDS

1. Some animals can live without food.
2. Insects need food in order to live.
3. Plants need food in order to live.
4. Food for plants comes from the environment of the plant.
5. When we change one part of the environment, nothing happens to the other parts.
6. Parts of the environment are interdependent.
7. Animals need plants in order to live.
8. Man can change the environment.
9. Man can live without plants.
10. Man can hurt his environment.
11. Water is stored only in lakes.
12. We never find water in the earth.
13. Man can store water for future use.
14. The water we drink comes from the Oconee River.
15. People dig wells to get to underground water.
16. We have to drink the water as it comes from the Oconee River.
17. It has been estimated that each person in Athens uses about 100 gallons of water per day.
18. It's okay if we waste water.
19. People use automobiles of different sizes.
20. The only way to travel about in a city is by using a car.
21. There is nothing we can do to reduce air pollution.
22. Air pollution is bad for man's lungs.
23. Cigarette smoking is dangerous to your health.
24. Man needs air to survive.
25. Large cities and small cities have the same number of people.
26. The air is never affected by automobiles.
27. In our town, people need cars.
28. Man can survive without air.
29. Some air pollution is caused by inefficient methods.
30. Jet airplanes pollute the air.
31. All animals need food in order to survive.
32. Insects can survive without food.
33. Plants can live without food.

34. Food for plants comes only from the rain.
35. Changes in one part of the environment affect other parts of the environment.
36. Parts of the environment are independent.
37. Animals can live without plants.
38. There is nothing man can do to change the environment.
39. Man needs plants in order to live.
40. Nothing man does hurts his environment.
41. Water is stored naturally in people.
42. Water is stored in the earth.
43. There is nothing man can do to keep water for later use.
44. Athens' drinking water is supplied by wells.
45. Underground water can never be used by people.
46. Man builds filtering plants to make water fit to drink.
47. In Athens, we each use about 1 gallon of water per day.
48. We should be careful about how we use water.
49. All automobiles are the same size.
50. There are other ways to travel within a city besides using a car.
51. Man can reduce the danger of air pollution.
52. It is good for us to breathe polluted air.
53. All people should smoke cigarettes.
54. Man can live without air.
55. A large city has a larger population than a small city.
56. Taking care of cars regularly reduces air pollution.
57. Every person has to have an automobile.
58. Man needs air to live.
59. The way we do things never affects the air.
60. Kite flying pollutes the air.

PRIMARY ENVIRONMENTAL AWARENESS
TEST SCORING SHEET (SAMPLE)

Name_____Date_____

School_____

1 - 31
2 - 32
3 - 33
4 - 34
5 - 35
6 - 36
7 - 37
8 - 38
9 - 39
10 - 40
11 - 41
12 - 42
13 - 43
14 - 44
15 - 45
16 - 46
17 - 47
18 - 48
19 - 49
20 - 50
21 - 51
22 - 52
23 - 53
24 - 54
25 - 55
26 - 56
27 - 57
28 - 58
29 - 59
30 - 60

DIRECTIONS

PEAT is a test that requires the child to respond to matched-pairs,[1] i.e., for every "yes" response there is a corresponding "no" response. For each level, the test has been structured so that the second half of the test items are reversals of the first half. When the child responds correctly to both forms of the item he is given credit. The scoring sheet on page 38 is used to assess the child's performance. If a student answers one item of the matched-pairs incorrectly, he receives no credit for both the items. If he answers both matched-pair items correctly, credit is given.

An elaboration of this technique is found in: [1]A. Guy Larkins and James P. Shaver, "Assessing Achievement in Elementary Social Studies" in Michaelis, John U. and Everett T. Keach, Jr. (eds.) Teaching Strategies in Elementary School Social Studies (F. E. Peacock Publishers; Itasca, Illinois, 1972), pp. 426-436.

PRIMARY ENVIRONMENTAL AWARENESS TEST KEYS

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Level One
Six-Year-Olds

1.	yes	31.	yes
2.	yes	32.	no
3.	no	33.	no
4.	yes	34.	yes
5.	yes	35.	no
6.	no	36.	no
7.	no	37.	yes
8.	no	38.	yes
9.	yes	39.	yes
10.	no	40.	no
11.	yes	41.	yes
12.	yes	42.	no
13.	yes	43.	no
14.	no	44.	no
15.	yes	45.	yes
16.	no	46.	no
17.	yes	47.	yes
18.	yes	48.	no
19.	no	49.	no
20.	yes	50.	yes
21.	yes	51.	no
22.	yes	52.	no
23.	yes	53.	no
24.	no	54.	no
25.	no	55.	yes
26.	no	56.	yes
27.	yes	57.	yes
28.	no	58.	no
29.	yes	59.	yes
30.	yes	60.	no

Level Two
Seven-Year-Olds

1.	yes	34.	no
2.	yes	35.	no
3.	no	36.	yes
4.	no	37.	yes
5.	yes	38.	no
6.	no	39.	yes
7.	yes	40.	no
8.	no	41.	yes
9.	no	42.	yes
10.	yes	43.	no
11.	no	44.	yes
12.	yes	45.	no
13.	yes	46.	no
14.	yes	47.	no
15.	no	48.	yes
16.	no	49.	yes
17.	yes	50.	no
18.	no	51.	yes
19.	yes	52.	no
20.	yes	53.	no
21.	no	54.	yes
22.	yes	55.	no
23.	no	56.	yes
24.	yes	57.	no
25.	yes	58.	no
26.	no	59.	yes
27.	yes	60.	no
28.	yes	61.	no
29.	no	62.	yes
30.	yes	63.	no
31.	yes	64.	no
32.	yes	65.	no
33.	no	66.	yes

Level Three
Eight-Year-Olds

1.	no	31.	yes
2.	yes	32.	no
3.	yes	33.	no
4.	yes	34.	no
5.	no	35.	yes
6.	yes	36.	no
7.	yes	37.	no
8.	yes	38.	no
9.	no	39.	yes
10.	yes	40.	no
11.	no	41.	yes
12.	no	42.	yes
13.	yes	43.	no
14.	yes	44.	no
15.	yes	45.	no
16.	no	46.	yes
17.	yes	47.	no
18.	no	48.	yes
19.	yes	49.	no
20.	no	50.	yes
21.	no	51.	yes
22.	yes	52.	no
23.	yes	53.	no
24.	yes	54.	no
25.	no	55.	yes
26.	no	56.	yes
27.	yes	57.	no
28.	no	58.	yes
29.	yes	59.	no
30.	yes	60.	no

V. BIBLIOGRAPHY

The following list of books and magazines are suggested readings that one should find useful in obtaining the background information necessary to develop an overall understanding of environmental education and its impact on our society. These sources have been divided into two categories: (1) those in which the reader will find surface information and activities pertaining to environmental education and (2) those that give the reader a more in-depth understanding of the various aspects of this field.

References of General Use

Dasmann, Raymond F. Environmental Conservation. New York: John Wiley and Sons, Inc., 1968.

Dvany, J. W. George, ed. Environment: Readings for Teachers. Reading, Mass.: Addison-Wesley, 1972.

Eddy, William H., Jr., Leon, Gonzalo S., and Milne, Robert C. Consider the Process of Living. Washington, D. C.: Conservation Foundation, 1972.

Lavaroni, Charles W. and O'Donnell, Patrick A. Air Pollution. Reading, Mass.: Addison-Wesley, 1971.

Lavaroni, Charles W., O'Donnell, Patrick A., and Lindberg, Lawrence A. Water Pollution. Reading, Mass.: Addison-Wesley, 1971.

Schoenfeld, Clay, ed. The Journal of Environmental Education. Madison, Wisconsin: Dembar Educational Research Services, Inc.

Schoenfeld, Clay, ed. Outlines of Environmental Education. Madison, Wisconsin: Dembar Educational Research Services, Inc., 1971.

Troost, Cornelius J. and Altman, Harold, ed. Environmental Handbook: A Source-book. New York: John Wiley and Sons, Inc., 1968.

Wentworth, Daniel F., Couchman, J. Kenneth, MacBean, John C., and Slether, Adam. Pollution - Examining Your Environment. Minneapolis, Minnesota: Mine Publications, Inc., 1971.

References for the Serious Student

Detwyler, Thomas R. Man's Impact on Environment. New York: McGraw Hill Book Company, 1971.

Wagner, Richard H. Environment and Man. New York: Norton and Company, 1971.

Level 1: Six Year Olds
Theme A: Man and the Land

INSTRUCTIONAL MODULE 1A

SUPPORT FOR MAN'S ACTIVITIES - A LOOK AT THE LAND

MODULE GENERALIZATION: Land provides support for man's activities.

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1973

Preface

The purpose of the Primary Environmental Education Project of the University of Georgia was to develop and field test nine instructional modules designed as supplementary material for a primary grades social studies program. The modules focus on teaching/learning activities that will build an understanding of the interrelationships between man and the land, water, and air. In the construction of the modules primary emphasis was given to the thinking processes of young children and the provision for many opportunities to engage in creative thinking.

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Cover design by Sherri Hardeman, a primary level pupil at Oconee Street Elementary School, Athens, Georgia.

REQUIRED MATERIALS

Throughout this module, a variety of materials and/or arrangements will be required. Some of these may take some time to secure. Provided below is a sequential listing of the needed materials.

1. Two sites where obviously different samples of soil can be collected, digging utensils, two envelopes per child

2. Drawing paper, crayons, plant items (foods) brought from home

3. Soil saved from first activity, mung bean seeds, half-pint milk cartons, bag of humus, chart paper, masking tape

4. Container of liquid plant food, bottle or can of Drano, masking tape

5. Jar of dirty soap water, pesticide, can of soft drink, coffee grounds, small container of used cooking oil

6. Chalk or markers

7. Chalk or markers, experience chart paper

8. Drawing paper, crayons, large paper for listing

9. Picture of woman angry at trespassers, other pictures of traffic patterns being followed or ignored

10. Pictures of a variety of land recreations, art paper, crayons

11. Same pictures utilized in number 10 above

12. Large sheet of paper mounted on cardboard, felt pen or crayon

Level One: Six Year Olds
Theme A: Man and the Land
MODULE GENERALIZATION: Land provides support for man's activities.

Content: There are many kinds of soil. Different kinds of soil can be found in the environment.

Materials: Two obviously different samples of soil from schoolgrounds (e.g., red clay, sandy soil), digging utensils, two envelopes per child.

Learning Experience

Teacher should find two places on schoolgrounds where red clay and sandy soil are found. If the soil does not vary much on your schoolgrounds, it will be necessary to collect one sample at another site. However, it is important that the two types of soil utilized are different. (Soil might also be collected at two depths or at two different places; e.g., river bottom and ridge top. At the time of collection of the soils the teacher should obtain a large amount of each as these soils will be used in another activity (see pages 5-6).

Provide each child with two enveloped labeled #1 Soil and #2 Soil. Have them collect samples of each type. When observing these in the classroom during discussion be sure that all the children manipulate the soil samples. Examine them in different kinds of light. Examine them wet and dry. After discussion samples should be saved for future activities.

Note: Children will likely use the term "dirt." Point out that another name for dirt is "soil."

Behavioral Objectives	Focusing Questions
Children will:	
Observe samples of soil (one sample at a time).	What are some things that you notice about soil from the #1 envelope?

Behavioral Objectives	Focusing Questions
	(Focus on color, texture, smell, etc.) What are some things that you notice about soil from the #2 envelope?
Note differences between the soil samples.	What things are different about these two soils?
Note similarities between the soil samples.	What things are the same about them?
Make statements about soil based on observations of samples.	From what we've noticed about the envelopes of soil, what could we say about soil?
Give reasons for their statements.	Why would you say that about these samples of soil?

Supplementary Learning Experiences

1. Have the children bring in samples of soil from different places: the woods, the bank of a stream, a place where a house is being built, etc. Put a cupful of each kind of soil in clear jars and label according to the source. Add water until each jar is almost full, cover, and shake well. Let the jars stand until the water is almost clear. Have the children observe: if there are layers of soil, things floating in the water, the feeling of the sediment (sandy or pebbly).

2. Get a piece of wire screen that has small holes in it. Put a handful of soil on it and shake the screen over a piece of paper. Let the children see the small pieces of rock that are left. (Do this with soil from different places.)

3. Give each child an envelope and let him bring to the class a sample of soil from around or near his home. Put the children's names on their envelopes. Set up an interest center with the many soil samples.

Content: Many plants grow in the soil. Some are eaten by man.
Materials: Drawing paper, crayons, plant items (foods) brought from home.

Learning Experience

Take the children on a short study trip outside (it could be a directed recess activity). Direct them to look at the many things they can find growing in the soil. When they return to the classroom, list items they saw growing in the soil on the schoolgrounds. Ask children to recall other things they might see growing in soil (anywhere). Add these items to the listing.

Have children draw pictures of items they've seen growing in the soil. As children finish their pictures print the name of each item on the pictures. Display pictures on a bulletin board in groups of "Plants We and Our Families Eat" and "Plants We and Our Families Don't Eat." Let children do the grouping of the pictures. After the grouping exercise, introduce the idea that we can eat many things that we don't eat but that some plants are poisonous.

Ask students to bring real examples of plants they and their families eat (beans, carrots, potatoes, etc.) from home. Arrange items brought from home on a table under the bulletin board and, with yarn, match real items on the table with labeled pictures on the bulletin board. If there is no picture of any real item brought from home, let a child draw a picture of it and print the name of the item on the picture. It can then be added to the appropriate category on the bulletin board.

Behavioral Objectives	Focusing Questions
Children will:	
Draw pictures of items they've seen growing in the soil.	What have you seen growing in soil? Make a picture of something that grows in the soil.

Behavioral Objectives	Focusing Questions
Group plants in categories of "Things You and Your Families Eat" and "Things You and Your Families Don't Eat."	Which of these pictures are of things that you and your family eat?
Predict possible results of not having soil as a medium of plant growth.	Just suppose that we had no soil to grow plants in. What would we eat?
Match real plants with labeled pictures.	With which picture does this item belong?

Supplementary Learning Experiences

1. Name some poisonous plants.
2. Look at the roots of some plants to see how the roots hold the plant in the soil.
3. Take a study trip to Farmer's Market to find out what vegetables are produced in the surrounding area.

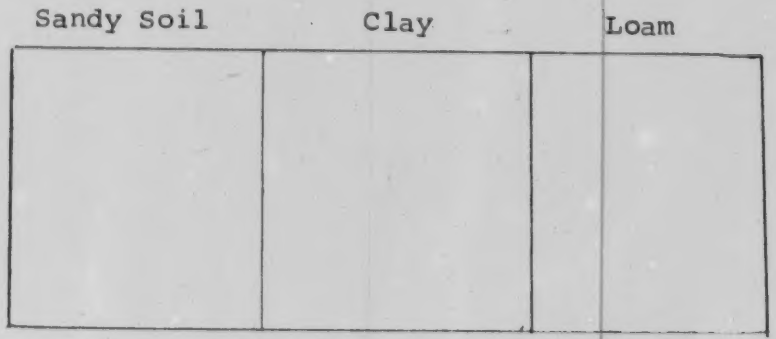
Content: Man plants things in the soil.

Materials: Soil saved from the first activity, mung bean seeds, one half pint milk cartons (from school cafeteria), small bag of humus (can be obtained from a nursery or local hardware store), chart paper, masking tape.

Learning Experience

Through discussion, derive some standards for judging the "healthiness" of plants; e.g., height, color, general appearance. Teacher should at this time plant ten cartons of seeds in loam soil to be used in later activity. Make a chart of the criteria for "healthiness" developed by the children.

Pass out a milk carton to each child. Have two large containers of different soils (red clay and sandy soil) collected in the first activity of the module. Put about a third of the sand and clay in a larger container and mix in humus (about 1/3 clay, 1/3 humus, and 1/3 sand). Mix well. This results in a loam soil. Divide class into three groups. Each group will use a different soil - one group will use the loam soil just made, the other two groups will use the rest of the clay and sand (or the two soils originally collected). Children will fill milk containers about 2/3 full using the soil assigned to their group. Direct class to plant mung bean seeds. Plant seeds approximately ¼" deep (about to first joint of child's index finger). Plant three to five beans in each container. Water soil lightly. When all children are finished planting, put containers on a table. Group according to the kind of soil used (use masking tape to divide table into three equal sections). Label each group. Tape labels on top or edges of the tape.



Experiment Table

Learning Experience

After the experiment has been set up, review the names of the three different kinds of soil. Ask children which soil they think will grow the "healthiest" plants. Find out the basis for their thinking and see if they have any ideas on how they will be able to check their predictions once the plants have had time to grow a few inches.

After approximately one week, judge the "healthiness" of the plants according to the standards the class set up.

Note: Mung bean seeds generally germinate in 24 hours. The day before planting, teachers can wrap the seeds in wet paper toweling so that seeds will be almost germinated when they are planted.

Behavioral Objectives	Focusing Questions
Children will:	
Identify some standards for judging "healthiness" of plants.	What does a healthy plant look like?
Name the three types of soil used for the experiment.	What are the names of three kinds of soil we used in our planting?
Predict which soil would grow plants the best (sand, clay, or clay and sand with humus added).	Which of the three kinds of soil will grow the "healthiest" plants? Why?
	How will we tell which soil makes the "healthiest" plants? How will you prove that once the plants have started growing?
About a week later: Measure the growth of the plants in the three types of soil.	About a week later: Which soil made the "healthiest" plant? How can you tell? (This will be done using the plants found in the "Nothing Added" row shown in Diagram 1, page 11, as the data source.

Supplementary Learning Experiences

1. Groups of children may wish to start some planter boxes of inexpensive flowers or vegetables that could be grown on a windowsill in the classroom.

2. In the spring the class might plant a small garden outside their classroom.

3. Field trip to a local nursery where class might purchase some seeds, plants, bulbs, etc.

4. Read The Tiny Seed by Eric Carle (Crowell, New York, 1970). The life of a seed from autumn throughout the year. About the Vegetables on Your Plate by Veva Elwell Allee (Melmont Publishers, Inc., Chicago, 1960) a colorful presentation of plants that become vegetables on our plates.

Content: Man can add elements to the soil that can increase its productivity.
Man can add elements to the soil that can decrease its productivity.

Materials: Plant samples from previous activity, container of liquid plant food (for example - Orthogrow), bottle of Drano, masking tape.

Learning Experience

After beans have sprouted and are about three inches tall, subdivide each of the three soil groups (loam, sand, and clay) into three groups. Leave three groups (one of each soil type) as they are, adding nothing. To the second group of three (one of each soil type) add some liquid fertilizer (using mixing instructions on label of bottle). To third group of three (one of each soil type) add a considerable amount of Drano. Caution children that Drano is a kind of poison that could make a person very sick. They are not to taste or touch the liquid. Remember that there will be more than one planting container in each of the nine groups (depending on the size of the class). See Diagram 1 on page 11 for an illustration of what the experiment table might look like when completed. Section off the nine groups with masking tape. Label the groups according to what was added to the soil.

Review by asking children to name three items added to the plant samples. Let children describe what they think may happen as a result of adding these elements. Question them as to the basis for their thinking (e.g. maybe they've seen their father add something to the soil in a garden). Review the class's criteria for "healthiness" of plants. Let them suggest ways they will later use to measure which plants are the healthiest.

After plants have grown a number of days and are a few inches tall, the class is ready to evaluate the results of this experiment.

Behavioral Objectives	Focusing Questions
Children will:	
Recall what was added to the different plant samples.	What were the different things we added to the soil of the plants?

Behavioral Objectives	Focusing Questions
Predict what might happen to each plant sample.	What do you think will happen to different plants? (Ask separately for each item added to the soils.) Why do you think that might happen?
Recall standards they developed for judging the "healthiness" of plants.	How will we be able to tell if what we think will happen does happen?
Apply their standards of plant "healthiness" to the different samples.	(A few days later after additives have had a good chance to take effect:) What was the result of adding _____ to the soil? Why can you say that? What is your proof?

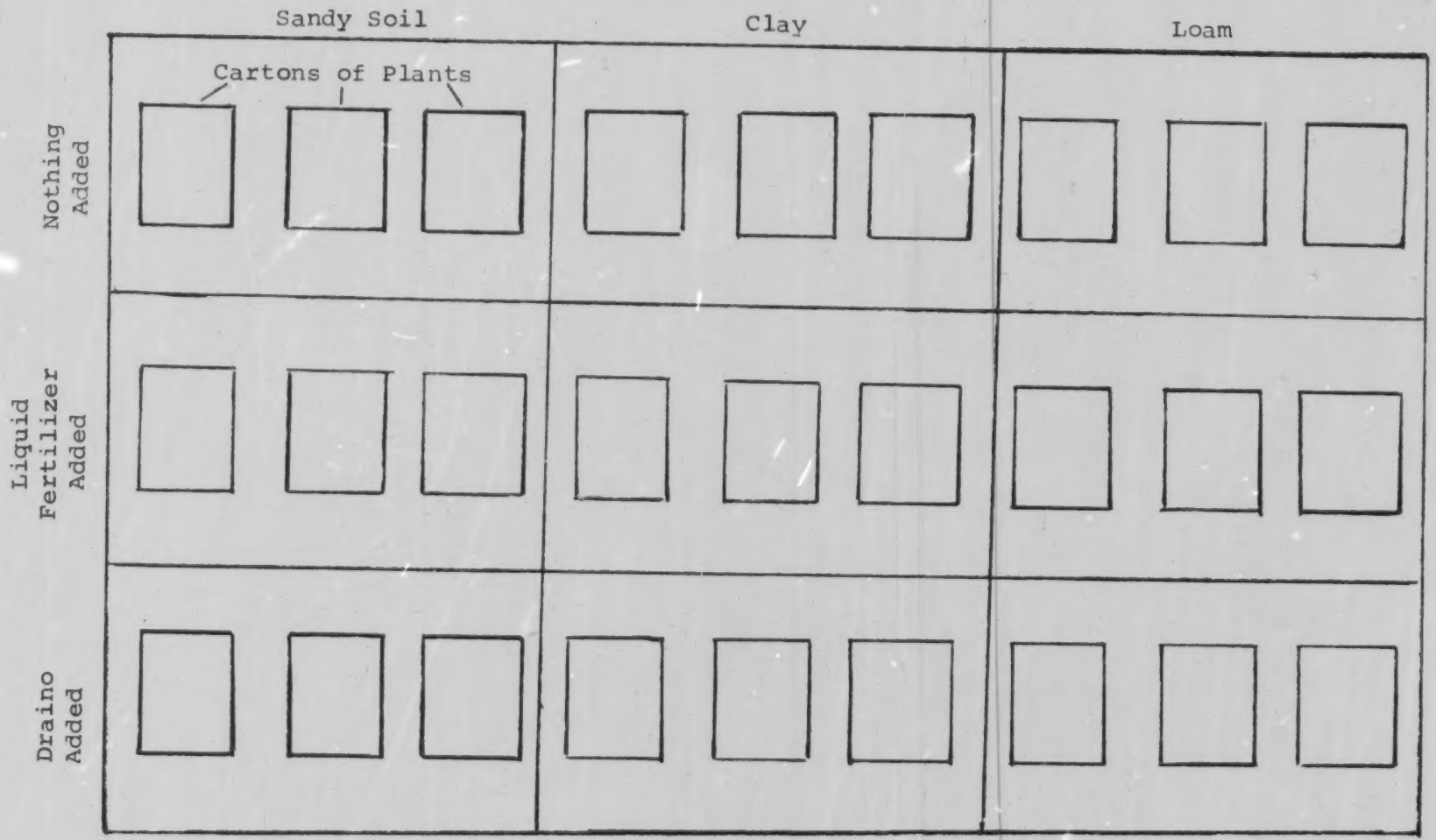
Supplementary Learning Experiences

1. Examine some other items that are poisonous. Point out the "crossbones" warning sign.

2. Use varying amounts of fertilizer on several sample plants.

Diagram 1

Illustration of Experiment Table
(Class Size = 27 Children)



Content: Man can add elements to the soil that can increase its productivity.
Man can add elements to the soil that can decrease its productivity.

Materials: Cartons of plants planted by teacher in earlier activity, jar of dirty soap water, pesticide, can of soft drink, coffee grounds, small container of used cooking oil.

Learning Experience

Use the cartons of seeds that you (teacher) planted earlier. Read each of the five short stories found on the next two pages. After each story add what was suggested to two different cartons of plants. Label the cartons according to what was added for observation purposes. In discussion predict what will happen to each carton of plants. Let children explain the thinking behind their predictions. After several days observe the plants to see what has happened. Use the criteria for "healthiness" of plants to determine if the added elements have made plants more or less "healthy."

Behavioral Objectives	Focusing Questions
Children will:	
Recall what was added to the different plant samples.	What were the different things we added to the plants?
Predict what might happen to each plant sample.	What do you think will happen to different plants? (Ask separately for each item added to the soils.)
Recall standards they developed for judging the "healthiness" of plants.	How will we be able to tell if what we think will happen does happen?
Apply their standards of plant "healthiness" to the different samples.	A few days later (once the elements added to the plants have had a chance to take effect): What <u>was</u> the result of adding _____ to the soil? How do you know?

STORIES TO ACCOMPANY THE ACTIVITY ON ADDING THINGS TO THE SOIL

Story 1

Miss Jones had had a busy day. Wow! Was she tired! She had just finished mopping the kitchen floor. The last thing she had left to do was to throw out the dirty mop water. She opened the back door to her little flower garden. Gee, it had been three days since she'd watered the flowers. Some water should help them. She threw the mop water on some flowers and went back inside to take a nap.

Story 2

Mr. Taylor had a good garden in his back yard. Everything was doing well except the beans. "Maybe they need some plant food," he thought. He went to the store and bought a bottle of plant food. When he got back home he read the directions on the bottle. He said to himself, "Those bean plants really look sick! They need much more plant food than the bottle says to give them. I'm not going to add any water to it like it says to do on the bottle. So he poured a lot of plant food from the bottle right on the plants.

Story 3

It had been quite a party. Twenty-five people had come to Mr. and Mrs. Smith's Halloween party. They sure had drunk a lot of coffee. Mrs. Smith wondered what she would do with all those coffee grounds. She was afraid to pour them down the sink. It might plug up the pipes. Then she remembered that someone had once told her that coffee grounds were good for plants. She went outside and dumped the used coffee grounds on the plants near her back door.

Story 4

It was a hot summer day. John and Linda had been playing and swimming all afternoon. All that running and swimming in the heat had made them thirsty. They ran back to the apartment to get something to drink. Mother gave them each a big can of pop. Back to the pool they went with their pop. It was so hot that before they could drink all of it, the pop was hot. The two children didn't want to drink the hot pop so they poured it on some plants that were growing along the side of the pool.

Story 5

That fried chicken had been so good! But now it was time for Mom to clean up the mess. She was getting ready to take the grease from the cooking pan outside to the garbage can, but then she thought about how cold and wet it was outside. It had rained almost all day. The sun had been hidden by the clouds the whole day. "What can I do with this smelly grease?" she said. Then she had an idea. She opened the kitchen window and poured the grease outside. But there were some pretty flowers outside under the window.

Content: People can move across land in different ways.
Materials: Playground and chalk or markers.

Learning Experience

On the playground mark off two places about 30 feet apart. Explain to the class that each person will have the opportunity to move from the one marker to the other in any way he chooses. Demonstrate to the class one way a person might move from point to point, e.g. hopping, skipping, crawling. Describe to the class your feelings while you were moving.

Give children time to think of different ways to move. You may ask them to be thinking of more than one way to move in case someone else uses their first idea. Impress upon them that it's not a race. Let them group around the beginning marker so all will be able to see each person as he moves from the beginning marker to the end marker. Children demonstrate, one by one, their way of moving. After each person performs, he comes back to the beginning marker, class members try to identify how that person moved across the land and the performer, if possible, describes to the other people the feelings he had while moving.

Note: The teacher may prefer to conduct this activity indoors.

Behavioral Objectives	Focusing Questions
Children will:	
Demonstrate different ways of moving across land.	What are some of the different ways you can move from this marker to that one? (Explain that the question is not to be answered aloud, but that they should think about it and do it when their turn comes.)

Behavioral Objectives	Focusing Questions
Verbally identify the mode of movement they used (as running, hopping, etc.).	What name would you give your way of moving across the land? Are there other times when a person might move in that way? When?
Describe how they felt when moving across the land that way.	How did you feel when you were moving across the land?

Supplementary Learning Experiences

1. Listen to the song "Sammy" in the album entitled, "Getting to Know Myself" by Hap Palmer and published by Educational Activities, Inc., Freeport, Long Island, New York, 1972.

2. Study pictures of different types of transportation vehicles used to move man and goods across land (cars, bikes, railroads, trucks, motorcycles, etc.). Clip pictures of land transportation vehicles from magazines.

Content: Some other living things also use land for movement.
Materials: Continuation of previous activity. It may be done at the same time or in a separate session. Experience chart paper.

Learning Experience

Explain that the first time the class moved across the land they did so as people but now they must move as some other living thing. After each person performs, other members of the class try to guess what he was by the way he was moving. If none can guess the movement, the performer then tells the class what he was depicting.

After returning to the classroom, spend a few minutes discussing with the children the activities in the yard. Using experience chart paper, make a listing as children tell ways they as people or other living things moved across the land. Then have children group items of their list according to common characteristics. Decide on names for the groups. On another sheet of experience chart paper write the group names or labels and under each group name or label write in the items from the list that were placed in the different groups. Keep these for the next lesson of this module.

Note: If time is limited, you could have the children do these activities in groups of five. However, each child should have the opportunity to tell the others what he did.

Behavioral Objectives	Focusing Questions
Children will:	
Demonstrate the ways other living things move across the land.	If you were not a person but were some other living thing, how would you move from this marker to that one? (Explain that the question is not to be answered aloud but demonstrated when their turn comes.)

Behavioral Objectives	Focusing Questions
List the ways they moved from one place to the other.	What are some of the ways we moved from one place to another?
Group ways they moved according to common characteristics; e.g., slow movement, fast movement, etc.	Which ways we moved could we put together because they are alike in some way? Why?
Label groups of movements.	What name might we give this group of ways of moving? Why?
Conclude that land is used by many different living things in many different ways.	What do your activities tell you about the number of ways living things move on land?

Supplementary Learning Experiences

1. Select an animal (bird, cat, dog, etc.) and then everyone in the class thinks of and acts out different ways that animal moves.
2. Move like some words sound; then, like their opposites. Move in a way you've never moved before.
3. Find things that can move and don't - carefully make them move.

Content: People set aside some land to move on (traffic patterns). This makes it efficient for people to get from one point to another quickly.

Materials: Drawing paper, crayons, school yard, large paper for list.

Learning Experience

Refer to the experience charts made in the last lesson. Ask children to recall what they have said about the ways people and animals move on the land. Ask the children if anything other than people and animals move on the land. Provide art supplies and have each child draw a picture of something that moves on the land that is neither a person nor an animal; e.g., car, train, bike, etc. When children are completed, let them tell what they have depicted and add the pictures to the experience chart. (Instead of drawing pictures the teacher could have the children find appropriate pictures in magazines, cut the pictures out, and add them to the chart.)

Once each person has presented and explained his picture, the children should group the pictures and label the groups. After groups are labeled, the pictures on the chart should be repositioned in order to be in their proper groups (as determined by children).

Briefly talk about activities so far (moving on land). Tell children that like detectives, they are going to go outside to search the schoolgrounds for evidence (signs) that something has moved on the land.

Note: At this point it may be necessary to prepare the children for the lesson by discussing what a sign is; e.g., How do we know what street we live on? How do we know some children in school are older than we are? Signs are bits of evidence that tell us things.

The teacher should take paper to list the evidence they see; e.g., tire tracks, grass worn down, bicycle tracks, animal tracks, bird tracks, etc. Direct their attention to roads, sidewalks, etc.

After returning to the classroom, read through the "signs" the children found. Focus on those signs or things the children found that point out how man has set aside certain land for movement

Learning Experience

(paths, roads, sidewalks, halls, etc.). Ask class, "Why do we have roads? Driveways? Sidewalks?" Find out what children think might happen if man did not set aside certain land for movement.

Behavioral Objectives	Focusing Questions
Children will:	
Recall activities of the previous lesson.	What did we find out yesterday about the ways people and animals move on the land?
Draw pictures of things other than people and animals that they have seen moving on land.	From what you have seen or heard about, what are some things other than people and animals that move on the land?
List things that move on land.	What have you shown in your picture that moves on land?
Group pictures according to common characteristics.	Which of these things that move on land are alike in some way? (Allow for a variety of response.)
State reasons for their groupings.	In what way are they alike?
Label groups of pictures.	What would you name this group? Why?
Observe evidences of land being used for movement.	What are some things you see that tell you that something has moved on this land?
State reasons why we have roads and driveways --reasons why we have sidewalks, etc.	Why do you think the roads you saw around the schoolgrounds were built? Why do you think we have sidewalks on and around the schoolgrounds?

Behavioral Objectives	Focusing Questions
State consequences of having no roads and sidewalks.	What are some things that might happen if we had no roads-- if we had no sidewalks?
State conclusions about reasons for roads and sidewalks.	Why do you think that might happen? We've been talking about reasons why we have roads and what might happen if we didn't have them. What could you say about why we have roads and sidewalks where we have them?

Supplementary Learning Experiences

1. Make children aware that traffic patterns exist in many places. Have them act out what it would be like in the hall, cafeteria, staircase, etc. if there were no traffic patterns there. Ask for other places where traffic moves in a pattern.

2. Go to a streetcorner near the school. Make a count of the vehicles that pass by in a five-minute period. Check the traffic flow for two or three other five-minute periods; e.g., 9:00 a.m., 10:30 a.m., 12:15 p.m., 1:30 p.m., and 2:30 p.m. Make a chart or simple graph of the data. Discuss any differences that may have been observed.

Content: When people don't use traffic patterns, problems come up.
Materials: Picture of woman angry at trespassers, other pictures of traffic patterns being followed and ignored.

Learning Experience

Group children so that all can see the picture of the angry woman. Give the children some time to study it before you ask them to identify things in the picture. Do not accept inferences at this step. If a child says, "I see trouble," ask what there is in the picture that makes him think so. Ask children how they think the woman is feeling. Make them provide support from the picture for their thinking. Ask, "How do you think the children feel? Why?"

Children will role play Mrs. Johnson and the children. Keep it brief so that several boys and girls will have a chance to play the roles. Solutions may be proposed and then role played. (e.g. A child says, "Mrs. Johnson could be nice." You could ask, "What do you think it would sound like if she were nice? You be Mrs. Johnson for us.") Role play several of the solutions proposed by the children. Following each, ask the class if what happened in the role playing could possibly happen.

Show other pictures of traffic patterns being followed and ignored. Ask the children to identify the traffic patterns and decide whether the traffic pattern is being followed or broken. They should substantiate their choices. When a traffic pattern is being ignored ask the class to identify possible consequences of not following the traffic pattern.

Behavioral Objectives	Focusing Questions
Children will:	
Identify items in a picture.	What are some of the things you see happening in this picture? What do you think the boys are doing? Where do you think this is?

Behavioral Objectives	Focusing Questions
State inferences about feelings of Mrs. Johnson.	How do you think she is feeling? (angry)
Give reasons to support their inferences.	Why might she be angry? (or any other feeling they mention)
State inferences about feelings of children in the picture.	How do you think the boys are feeling?
Give reasons to support their inferences.	What makes you think so? Why would they feel that way?
Propose solutions to the problem.	What could Mrs. Johnson do to make this a better situation? (Get a few ideas.) Why would this be a good idea?
Test their solutions in role-playing situations.	If you were Mrs. Johnson, what might you be saying and doing? If you were the children, what do you think they would be saying and doing? (for each role play)

Supplementary Learning Experiences

1. Invite a policeman to the class to talk about the importance of riding bikes on predetermined traffic (bike) routes.

2. Have the children think of as many things as possible that tell them what traffic patterns there are; e.g., signs, lights, signals, rules, etc.

Content: Man uses land for recreational purposes.
Materials: Pictures of a variety of land recreations, art paper, crayons.

Learning Experience

Show pictures of man using land for recreational purposes one at a time to the class allowing sufficient time to allow some observation of each picture. In the collection of pictures have illustrations of both recreational uses that can be made of the land in the area and recreational uses that can't or aren't (but maybe could) be made of the land in the area. Place each picture on the board ledge and over it print what the children say is happening, (e.g. hunting, skiing, football). Ask children to tell how man is using the land for recreation (fun) in each picture. Provide children with art paper and let them draw a picture of the activity they would most like to be part of, putting themselves in the picture. (This could be an activity depicted in one of the presented pictures or any other way one could use the land for recreation. Emphasis should be made that the pictures are to be of how man uses the land for fun.) If time permits, let each child show where he drew himself into the picture and tell the class how he is using the land. Display the pictures on a bulletin board. Have the class propose an appropriate title for the display.

Behavioral Objectives	Focusing Questions
Children will:	
Observe pictures and identify a number of recreational uses of the land.	What do you see happening in this picture? Notice in all these pictures people are having fun on the land.
Draw a picture of the activity they would most like to be part of, putting themselves in the picture.	Looking at all these pictures, which one do you think would be the most fun for you? Draw your own picture of it and draw yourself into the picture.

Supplementary Learning Experiences

1. Find pictures in old magazines that show man using the land for recreation. Bring photographs from home illustrating your family using the land for recreational purposes. Design a bulletin board display using the pictures.

2. Make texture scenes of land being used for recreation. Use pieces of material and glue to create the scene.

Content: Characteristics of the land can limit the kinds of recreational use made of it.

Materials: Pictures of a variety of recreations (from previous activity).

Learning Experience

Show the pictures (from the previous lesson) one at a time. After showing each picture ask the questions presented below in the column, "Focusing Questions."

Behavioral Objectives	Focusing Questions
Children will:	
Observe pictures and state whether or not that recreation is available in this area.	Looking at the things people are doing in this picture, do you have this kind of fun around here? Do others have this kind of fun in our area?
State reasons why activity is available or not available.	If that recreational use is being undertaken in the area, ask, "Why can we do that in our area?" If the recreational use is not being undertaken in the area, ask, "Why can't we (ski, hunt, etc.) in this area? What would we need in order to use the land in that way? Could man do something that might make it possible to _____ in this area?

Supplementary Learning Experiences

1. Using the pictures of the bulletin board display suggested under "Supplementary Learning Experiences," page 28, categorize pictures into "Ways We Can Use the Land for Fun Here" and "Ways to Use the Land for Fun Not Available Here."

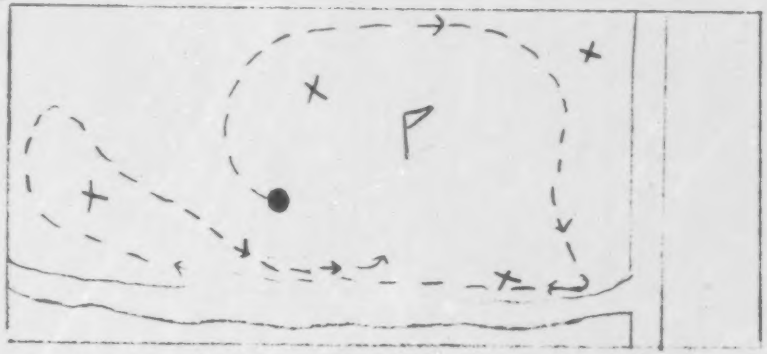
Supplementary Learning Experiences

2. Use pictures of land of varied geographical features; e.g., snow-capped mountains, desert scene, forest, etc. As you show each picture, make up a little story about people going there for recreation that is unsuited to the place; e.g., skiing in the desert. Let the children discuss what is wrong with the story. They could change the story to make it logical.

Content: People must recognize land problems and make decisions about them.
Materials: Playground, large paper mounted on cardboard, felt pen or crayon (for drawing map).

Learning Experience

Ask class to recall the study of the pictures illustrating traffic patterns being followed or ignored. Tell them they are going to observe carefully again but this time the schoolground is the picture and they are going to search for possible land problems there. At this point, the teacher may have to develop the concept of "problem." Provide an example of a land problem so children will have an idea of what they might be looking for. Prepare the children for a study trip to the schoolgrounds. Explain that when they walk along, as soon as they see a problem, they should say, "Stop!" and tell the class what the problem is that they have found. Explain that as they discover problems you will mark them on a map picture. Begin by drawing with the children a very simple map of the schoolgrounds on a large paper mounted on cardboard. Put on it only the building and roads. Then mark the classroom on it. Then go outside and begin the walk just outside the classroom. (If possible the children should look through the window to verify exactly where they are starting the trip.) As the class moves around on the schoolground, plot the course on the map for all to see. Fill in other key places or items as you come upon them during the study trip.



Learning Experience

Once you have completed the study trip, return to the classroom and display the map. Allow the children to identify problems they found. List them on the chalkboard. Group children in groups of five and tell them to brainstorm (talk) together for a few minutes about some things they could do to help solve the problem. (Identify a specfic problem for each group.) Tell them to be ready to report to the class about what they decided. If they are unfamiliar with this procedure, appoint one in each group to report.

After reports have been made and solutions proposed, ask the total group to decide which problem should be worked on first by the class. The criteria for selecting should be that of most need. If several suggestions are made, have them select their choice by a show of hands. When they decide, have them list specific steps that should be done to help solve that selected problem. Number the list of steps according to the order of what should be done first, second, etc. Depending on the nature of the problem they decide to solve, divide the tasks or do it as a total class activity. (Some typical problems that might follow from this study include barren plots of soil, paths worn in grass, etc.). Children may identify problems that were not specifically studied in this module. If this is the case, go ahead and use the problem if they can effectively solve it.

Note: To provide for feedback, suggest a major bulletin board display in the school. Some of the children could use cameras, take pictures, and make a display of pictures (BEFORE & AFTER) to illustrate the effect their actions had on the schoolgrounds.

Behavioral Objectives	Focusing Questions
Children will:	
Tell what they remember about a previous picture activity.	What do you remember about the lesson with the pictures of traffic problems? What were we looking for in the pictures?

Behavioral Objectives	Focusing Questions
Identify problem areas in the schoolgrounds.	What are some problems you notice on the schoolgrounds?
Explain why they think it is a problem.	Why do you think that is a problem?
List problems they found.	What are some of the problems we marked on our map?
Discuss in groups of five what they could do to solve the problem.	What are some things you could do to solve the problem?
Report their discussions.	What has your group decided? What made you decide on that? (Allow others in the group to contribute here.)
Select the problem that most needs to be worked on.	Which of these problems do you think needs our help most?
List the things that have to be done.	What will we have to do to help?
Order the listing of things to be done according to what should be done first, second, etc.	Let's look at the things we'll have to do. Think about them for a minute and decide which should be the first thing we do.
State reasons for order.	Why should we do that first? What should we do next?

Supplementary Learning Experiences

1. Have the children look in their own neighborhoods for some things that could be problems if nobody took care of them. (Lawns if no one mowed them or watered them, gardens if no one weeded them, bushes if they weren't cut.)

Supplementary Learning Experiences

2. Have the children work in pairs. One will draw or paint a scene where the problem exists and his partner will draw a picture of the same scene but with the problem taken care of. (A lawn that needs cutting and the same lawn after someone has cut it.) These could be placed next to each other in a display. Each pair could explain their pictures to the class discussing the differences between them.

Level 2: Seven Year Olds
Theme A: Man and the Land

INSTRUCTIONAL MODULE 2A

SOLID WASTE DISPOSAL

MODULE GENERALIZATION: Man makes efficient use of the land by planning for solid waste disposal.

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Preface

The purpose of the Primary Environmental Education Project of the University of Georgia was to develop and field test nine instructional modules designed as supplementary material for a primary grades social studies program. The modules focus on teaching/learning activities that will build an understanding of the interrelationships between man and the land, water, and air. In the construction of the modules primary emphasis was given to the thinking processes of young children and the provision for many opportunities to engage in creative thinking.

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Cover design by Sherri Hardeman, a primary level pupil at Oconee Street Elementary School, Athens, Georgia.

REQUIRED MATERIALS

Throughout this module, a variety of materials and/or arrangements will be required. Some of these may take some time to secure. Provided below is a sequential listing of the needed materials.

1. Unwanted contents of desks, lockers, and teacher's desk, chart paper
2. Study trip to nearby supermarket, large paper mounted on cardboard, felt pen
3. Bulletin board or display table, art paper, crayons
4. Full waste paper basket from previous day, stapler, scissors
5. Several no deposit bottles and returnable bottles
6. Several empty cans, pop can for each child, large sheet of cardboard
7. CARE study prints
8. Transportation to the city dump. paper for recording data
9. For each group: 1 clear plastic cup, loam, several small pieces of different kinds of garbage, aluminum foil.
10. Yarn, construction paper, magazines
11. Slides of litter and littering (appropriate pictures can be substituted for the slides)
12. Materials dictated by the proposed actions of the class

Level Two: Seven Year Olds
Theme A: Man and the Land
MODULE GENERALIZATION: Man makes efficient use of the land by planning for solid waste disposal.

Content: Garbage is everything we don't want or use.
Materials: Unwanted contents of desks, lockers, teacher's desk, chart paper.

Learning Experience

Explain to the children that they are going to clean out their desks or lockers and get rid of everything they don't want to keep. When they have had a few minutes to do this, have them bring their collection of garbage to an assigned place in the room (a table or floor space, etc.). Add from your desk some things that may not be in their collection of garbage. Have the children group items from the combined collection on the basis of similarities. Let children explain reasons for their groupings. Have them suggest labels or titles for each of the groups they form. Keep the groups and labels on a chart for use in subsequent lessons. Discuss with the children some different things they might see in the garbage from the lunchroom.

Note: This lesson could be carried on by using the contents of the waste basket instead of individual desks if you would find that more convenient.

Behavioral Objectives	Focusing Questions
Children will:	
Empty desks or lockers of things they don't want or use.	For the next few minutes you will have time to go through your things for anything you don't want or use.

Behavioral Objectives	Focusing Questions
Combine their garbage at a designated place in the room.	
List some of the things they have thrown away.	What are some of the things you see here that we are throwing away?
Group items of garbage according to common characteristics.	Which of these things we are throwing away could we put together because they are alike? (papers, pencils & pens, covers, etc.)
Give reasons for their groupings.	Why are they alike?
Label groups of garbage.	What name could we give this pile (papers, books, boxes, etc.)?
Give reasons for labels.	Why do you think so?
Recall different things in garbage from cafeteria.	What are some different things we might see in the garbage from the lunchroom that we don't have here?

Supplementary Learning Experiences

1. Instead of conducting this lesson with the total class, the teacher may wish to use several wastebaskets and have children work in smaller groups.

2. Pretend with children that they will not be able to clean their desks for one month and that during that month wastebaskets in the school will not be emptied. Verbalize what the room might look like after a couple of weeks. Draw a picture of the room. Ask, "Would you like to be a student in a room like that?"

3. Play the song, "Sara Sylvia Cynthia Stout Will Not Take the Garbage Out," by Shel Silverstein on the album, "Freakin at the Freakers Ball," Columbia Records. Ask children, "What might happen if everyone in your family refused to take out the garbage?"

Content: Packaging, although attractive and convenient, adds to disposal problems.
Materials: Nearby supermarket, large paper mounted on cardboard, felt pen.

Learning Experience

Plan to take the children to visit a grocery store or supermarket in the nearby area. Tell the children they are going to look at the goods in the grocery store which will later become garbage. Discuss possible reasons why these goods might eventually become garbage. While at the grocery store, list the goods that the children find that will eventually become garbage.

When you return to the classroom, use this list as the basis for discussion. Have the children group goods from their list together because they are alike in some way and label the groupings. Have the children give reasons for their groupings and labels. Some probable categories might include: PAPER& PLASTIC, CANS, BOTTLES, LEFT-OVER FOOD, EVERYTHING ELSE.

Have children think about the garbage they found in their desks and the ways they grouped it together (display charts made in the previous lesson). Find out how the things they saw in the grocery store were different from the things they found in their desks. Were there any ways the two groups of garbage were alike? If so, have the class combine any of the groupings of garbage from the desks and grocery store that were alike in some way.

Note: If your schedule permits an early visit to the supermarket, you might contact the manager and ask him to provide for the class visit a half hour before opening time (8:30 - 9:00 a.m.). Because of the number of children who will want their observations listed, perhaps you could invite a few mother helpers to accompany you to the store. They could each take a group and list children's items. The lists could then be combined when you return to school.

Behavioral Objectives	Focusing Questions
Children will:	
Visit the local grocery store.	

Behavioral Objectives	Focusing Questions
Observe the variety of things displayed there.	What are some of the things you see in this grocery store?
List those things which will later become garbage.	What things that we see here and that look so pretty now will eventually become garbage?
Give reasons why they will become garbage.	Why will those things become garbage?
Group items from the supermarket.	Which of these things which will become garbage are alike in some way?
Give reasons for their groupings.	Why are they alike?
Label groups of grocery store items.	What could we call this group of things that will become garbage?
Give reasons for labels.	Why is that a good name?
Compare the garbage from their desks with the garbage from the grocery store.	Think about the garbage we found in our desks and the ways we grouped it together. (Display charts made in previous lesson.) In what ways were the things we saw in the grocery store <u>different</u> from the things we found in our desks? In what ways were they alike?
Combine groups of labels from desks and supermarket.	Which of the groups that we had from desks could we put together with the ones from the supermarket?

Behavioral Objectives	Focusing Questions
Conclude that the packaging of goods is a major source of garbage.	What part of the items you saw in the grocery store will make up the most garbage, the content or the containers?

Supplementary Learning Experiences

1. If the trip to the supermarket is impossible have the children elicit help of their parents by having them together list things bought at the last visit to the grocery store that will later become garbage. Have the children bring their lists to class for grouping.

2. Discuss the reasons we package; e.g., advertising and sanitation. Consider the dangers caused by different items of solid waste: broken bottles, plastic bags, raw edges of tin cans.

Content: Some of what we buy ends up as garbage.
Materials: Bulletin board or display table, art paper, crayons.

Learning Experience

Recall with the class the trip to the supermarket and what was discovered there. (Things that would later become garbage.) Explain that now they are going to look at their garbage at home in order to find some item that was once sold at the grocery store. Direct each child to bring one of these items for a display. Arrange for a 3-dimensional bulletin board display of the collected items classified under the main categories established in the previous lesson: PAPER, PLASTIC, CANS, BOTTLES, LEFT-OVER FOODS, EVERYTHING ELSE (or any other classification the children may have suggested.) After the display has been arranged, distribute art paper and crayons to each child. Direct the children to divide the length of the paper in half. Have them draw a BEFORE & AFTER picture; an item before it became garbage on one half of the sheet and the same item after it became garbage on the other half of the sheet. If time allows, have children show each other their pictures. If there is not enough time for each child to present his work to the total class, have children show and explain their pictures to each other in small groups of three or four.

Behavioral Objectives

Children will:

Review what they discovered at the grocery store.

Focusing Questions

Remember when we went to visit the supermarket? We looked for things that would become garbage. What were some of those things?

Behavioral Objectives	Focusing Questions
Bring to class selected garbage items that were once sold at the grocery store.	Now let's take a look at our garbage at home. Bring to class one item that started out at the supermarket and ended up in your garbage.
Classify items for display under main categories: PAPER & PLASTIC, CANS, BOTTLES, LEFT-OVER FOODS, EVERYTHING ELSE (or other categories formed by the class).	Let's look at the names we gave to kinds of garbage in the last lesson. Which of these names could your item fit under?
Draw pictures of some item of garbage BEFORE & AFTER.	Let's think back to how these things looked before they became garbage. Divide your sheet of paper in half. (Demonstrate) Choose one item of garbage and draw a picture of how it looked BEFORE it became garbage on one half of the page and how it looks AFTER (as garbage) on the other half.

Supplementary Learning Experiences

1. Develop a lesson dealing with consumer education. For example, we pay for many things by the weight of the items. What proportion of the weight we buy is not eaten: bone in the meat, liquid in the cans of vegetables, etc.?
2. Find out from a grocer if the cost of items sold by weight is figured on the weight of the item itself or the weight of the item and the package or container it comes in.

Content: Used paper is a major source of solid waste. Used paper can often be reused.

Materials: Full wastebasket left from previous day, stapler, scissors.

Learning Experience

Have students recall first activity when they cleaned their desks. Ask what they remember being the biggest source of garbage. Then take full wastebasket from previous day (the night before be sure to ask the janitor not to empty the wastebasket). Dump contents on the floor (put down old newspaper before dumping). Let children help sort the garbage into two piles - paper and non-paper. Have the children decide which pile is larger. Ask children if they would get the same results emptying garbage at home. Question children as to paper products they would find in the garbage at home that they did not find in the wastebasket at school, Then refer back to paper from wastebasket. Analyze several sheets of used paper to see what they have in common. (After some discussion focus attention on sheets written on only one side.)

Divide children into groups of two for a brainstorming activity and list on the chalkboard their ideas as to how they could reuse the paper from the wastebasket in order to cut down on the amount of paper being thrown away. Demonstrate how sheets of paper used on only one side can be quartered, cut, and stapled together to produce note pads. Designate a collection point in the room where children can deposit sheets of paper used on only one side. After numerous sheets have been collected, let children make note pads. They may wish to give finished note pads to other teachers, the principal, etc. (The teacher might make a cover sheet for the note pads on ditto paper that would briefly explain this activity and its purpose.) Encourage children to implement other ideas they formulated for reusing paper.

Note: The teacher may prefer to implement one of the ideas suggested by the children if the resources and time necessary for completing the project are available.

Behavioral Objectives	Focusing Questions
Children will:	
Recall results of first activity.	When we cleaned our desks and sorted the waste, which pile of garbage was largest?
Classify garbage from wastebasket as paper or non-paper.	Sort the garbage from the wastebasket into two piles, one pile of paper and the other pile of non-paper.
Compare and contrast paper elements in school and home garbage.	How is the garbage from our pile different from the garbage found at our homes? What kinds of paper might you find in the garbage at home that was not in our wastebasket at school?
Analyze sheets of used paper to determine what they have in common.	What do these sheets of paper have in common? How are they alike?
Propose ideas for cutting down on the amount of paper thrown away.	Let's look at the paper that is used only on one side. In what ways could we reuse this paper in order to cut down on the amount of wasted paper?
Make note pads from sheets of partially used paper.	How did this project help us make better use of paper?

Supplementary Learning Experiences

1. The children may wish to make the note pad activity a school project. They would then organize into teams to explain their project to other classes and organize collection, construction, and disbursement logistics.

2. When the children are making the note pads, teach basic skills of using the ruler when dividing paper into fourths.

Supplementary Learning Experiences

3. Arrange for the children to visit a paper recycling plant. Have the children collect old newspapers to be taken to the paper recycling plant.

4. Save paper used on both sides for a papier mache project. Old cans could be used as the base for papier mache animals.

5. Obtain a large cardboard box (about the size a washing machine comes in) from a source such as Georgia Power. Cut an opening near the top for the mouth of "Mr. Papereater." Let the children glue or tape on ears and paint eyes, lips, nose, etc. This will create a large, colorful paper basket for the classroom.

6. Read, "Miniature Paper-Making Mill" in The Grade Teacher, February, 1966. This interesting article describes in detail how children can make their own paper.

Content: Bottles (glass products) often result in solid waste. Bottles can be used creatively to make items for the home or classroom. Glass can be reused.

Materials: No-deposit bottles, returnable bottles.

Learning Experience

Ask children if they have ever gone pop-bottle hunting. If any have, ask where they looked and what they did with the bottles after they found them. Display several no-deposit, no-return bottles and deposit-return bottles. After pupils have had time to look at the bottles, see if they have noticed any differences. Focus on whether or not bottles are returnable. Have children explain how the deposit and return system works at the grocery store. Discuss what happens to bottles after they have been emptied. (What can you do with a deposit-return bottle? How are returnable bottles reused? Which bottles end up in the garbage most often, returnable bottles or non-returnable bottles?)

Ask what bottles are made of. Can they think of a way that a bottle could be used over and over? Can they think of a way two little bottles could be made into one big bottle? Present the situations described on pages 16-17 . After each situation has been presented, select children to describe how they would feel about bottles if they were the key character in the situation. Once all situations have been discussed, point out that how you feel about returnable vs. non-returnable bottles may depend on who you are, the kind of work you do, the specific situation, etc.

If non-returnable bottles can cause so many problems how could we use them around the home or school to make things that would be of help or would make our home or room pretty? If the teacher wishes to let the class work with bottles, several suggestions are given in the enrichment activities.

Behavioral Objectives	Focusing Questions
Children will:	
Recall any experiences of hunting for bottles.	Have any of you ever gone pop bottle hunting? Where did you look? What did you do with the bottles after you found them?
Compare non-returnable bottles with returnable bottles.	How are these bottles alike? How are they different?
Explain how the deposit and return on bottles works at a grocery store.	When do you pay the deposit on these bottles? How do you get the deposit back?
Discuss what might happen to bottles once they have been emptied.	What happens to bottles after they have been emptied?
Explain how bottles can be used over and over and how bottles can be melted into other bottles.	Can you think of a way bottles could be used over and over? Can you think of a way two little bottles could be made into one big bottle?
Decide whether they would favor returnable bottles or non-returnable bottles.	If you were the grocery store man, would you rather have returnable bottles or non-returnable bottles? (Repeat for each situation.)
Explain why they made their decisions.	Why would you rather have that kind of bottle?
Propose methods of converting no-deposit bottles into attractive or practical items for the home or school.	Can you think of a way to make non-returnable bottles into pretty things you could use at home or school? What would you have to do to make it? How will putting non-returnable bottles to another use help cut down on the amount of garbage we have?

Supplementary Learning Experiences

1. Activities dealing with the uses of no-deposit bottles:
   a. Make vases or candle holders decorated with tissue paper or papier mache using paper saved from prior lesson.
   b. Teacher can obtain a glass-cutting craft set and children can cut the tops off bottles and make drinking glasses.
   c. Make mosaics using broken glass. (Children can wear gloves to protect their hands.)

2. Take a study trip to a bottling plant so children can see how soda pop is bottled. If possible, have someone at the plant explain how deposit bottles are reused.

3. Have each child interview four neighbors in order to compare the number of families that prefer buying drinks in deposit bottles with the number of families that prefer no-deposit bottles.

RETURNABLE OR NON-RETURNABLE BOTTLES

If you buy a six-pack of pop in returnable bottles, you pay 18¢ deposit for the bottles (3¢ a bottle). When the empty bottles are returned to the grocery store, you get the 18¢ back. (If you buy the large bottles, the deposit is usually 10¢ per bottle.) If the pop comes in bottles that are not to be returned, you pay no deposit and do not have to bring the bottles back to the grocery store.

Some people are in favor of returnable bottles because then they do not have to worry about getting rid of the bottles. They can just bring them back to the store for the money. They say that if the bottles are returned to the store to get money back the bottles won't be thrown along the road and become litter.

Other people favor bottles that do not have to be returned. They often say that it's too much bother to have to bring bottles back to the store to get their money back. It's easier to just throw the bottles in the garbage.

Listen to what the following people have to say about pop bottles. For each person decide if he would be in favor of returnable or non-returnable bottles.

Grocery Store Man

When people buy returnable bottles they pay me 3¢ a bottle for the deposit. When they return the bottle I give them back 3¢ for each bottle. I make no money from the people. The pop companies do not pay me for handling the bottles. I have to take the time to collect and pay back the money on the bottles. I have to set aside space in my store to collect the empty bottles. But I don't get paid for doing all this.

Driver

One night as I was driving along the highway I ran over a broken pop bottle. Before I knew it, I had a flat tire. In the middle of that cold night I had to get out of the car and change the tire. Boy, I wish I could get my hands on the person who threw that bottle on the road.

Second-Grader Buying Pop

A bottle of pop costs 10¢. That's just exactly what I have - one dime. I'm going to buy a bottle. Oh, oh, I just remembered; if I take the bottle with me it'll cost 13¢. I'll have to pay 3¢ for the bottle. But I only have 10¢. Well, I guess I'll buy a candy bar instead.

Children Playing on City Playground

It's fun to come to the playground to play football with my friends. There's only one problem. Everytime we come to the playground we have to pick up the pop bottles from the football field before we can start. If we don't someone could get hurt. The whole bottles aren't bad, but some of the bottles are broken. Those broken bottles could sure cut you if you fell on one.

Garbage Collector

It sure is hard work picking up trash. We don't have the big, new trucks so we have to lift the garbage cans to dump them in our truck. Paper isn't so bad, but a lot of those pop bottles are heavy and some of the broken bottles can be dangerous. Why do people have to throw so many bottles in their garbage?

Mother Going Grocery Shopping

Wow! We've really drunk a lot of pop the past two weeks. Twenty-four bottles to take back to the store. The back seat of my car is already full. Where will I set all these bottles? Why do I have to carry them all out to the car? They're heavy. I don't really want to take them back to the supermarket, but if I don't I won't get my money back. And twenty-four bottles, too. Let's see; that's 72¢ I'll get back. Is all the bother really worth 72¢?

City Worker

My job is keeping our city clean. Do you know that pop bottles are one of our biggest problems? We pick up hundreds of them from the sides of roads every day.

Content: Cans are often found in our garbage. Some cans can be reused. Used cans can be used in practical ways.

Materials: Several empty cans (vegetable, pop, etc.) for demonstration, pop can for each child, glue, large sheet of cardboard (ideal would be a side of a cardboard box used in packing refrigerators, etc. - check a local hardware-appliance store).

Learning Experience

Refer back to lesson on glass (bottles). Focus attention on the fact that some bottles can be returned for money. Display several used cans. Ask if they can return cans to a grocer for money. Discuss what happens to most cans after what's in them has been used. Put three or four cans in a small paper bag and show how much space they take. (Then take cans out and with a hammer smash the cans until they're nearly flat. Put cans back in the bag. Compare space they now take to the space used before compacted. Ask class if anyone has seen one of the machines that "packs" garbage (compactor). If so, let him describe it to the class. The teacher could arrange an excursion to a home or store where they could see a compactor at work. (Children find this quite fascinating.) Discuss how a family without a compactor could "pack" their garbage so it would not take as much room in a garbage truck. How does packing the garbage help people who pick up the garbage? How does packing the garbage help your family? Explore possibilities of how cans could be reused. If children don't mention recycling, explain that some companies take used cans and make new cans from them (recycling). Let children describe some ways they could make use of cans around the home and school. Introduce project described and illustrated in Diagram 1 on page 22 . Children make their individual mail cans and put them on their post office board. Once post office is completed, have children tell ways in which it can be used.

Behavioral Objectives	Focusing Questions
Children will:	
Compare deposit return policies of bottles and cans.	Remember our discussion about returning bottles to the grocery store for money?

Behavioral Objectives	Focusing Questions
	Why do you suppose we don't return empty cans?
State what happens to cans once their contents have been used.	What happens to cans after what's in them has been used?
Compare space consumed by compacted garbage with space consumed by the same amount of garbage that was not compacted.	Which way did the cans take less space?
Describe how a garbage compactor works.	How do garbage compactors work? What do they do to the garbage?
Propose methods of compacting garbage without the use of a mechanical compactor.	How could your family "pack" its garbage if you do not have a compactor?
Explain how compacting garbage helps the garbage collector and how it helps the family.	How does packing the garbage help the garbage collectors? How does it help your family?
Propose methods of reusing cans.	What things could you make from cans that have been emptied? How would you make them?
Use emptied cans in the construction of a class mailbox.	How can we use the mailboxes?

Supplementary Learning Experiences

1. Create something out of used cans. Suggestions:
   a. a game
   b. a sculpture
   c. pictures with the use of flip tops

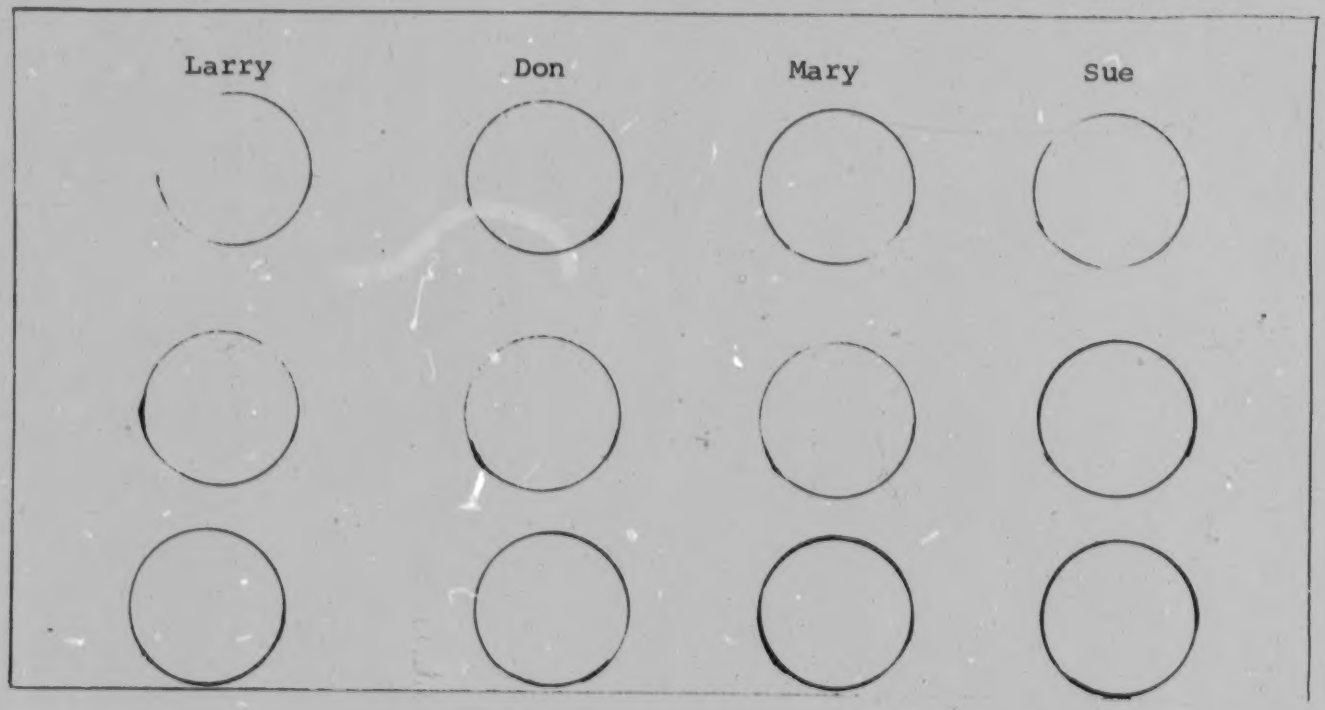
d. decorate the outsides of cans for book ends. Fill them with rocks collected by children.
e. decorate the sides of cans and use them as pencil holders.

2. Identify some things that can be purchased in both cans and bottles. Choose which method, canned or bottled, you would prefer to buy.

3. Discuss what people could do with the tabs and lids from opened cans in order to prevent injury to others.

Diagram 1
Class Mailbox

Have each child bring one or more pop cans from home. Use canopener to take tops off cans. Cut rectangles of construction paper to fit over cans. (Make rectangles about 1" longer than needed so there will be room for the paper to overlap when it's taken over the can.) Children then pick their color of paper and tempera paints to create designs on the paper rectangles. When paint is dry, tape rectangles to cans. Using Elmer's Glue around bottom rim of cans, glue cans to the large sheet of cardboard or you can secure cans to peg board with screws or bolts and nuts. Let children help decide how cans could be arranged on the cardboard. Once glue has dried, write children's names by their mailbox and attach post office to the wall. Mailbox can be used as a substitute for picking up and passing out paper, children leaving messages for one another, school messages to go home, etc. Be sure that you arrange to leave one or two messages for all children so that mail boxes are used.



Content: Left-over food does not have to become garbage.
Materials: Studyprints.

Learning Experience

Discuss with class what constitutes left-overs (food left on plates, too much cooked, a little bit left). Have the children state some reasons why food is left over. In asking for reasons, pursue questioning to explore the idea of abundance bringing about a lack of appreciation. Introduce pictures of children who are obviously hungry (CARE, UNICEF). Allow time for observation and then have the children pretend they are the children in the picture. Have them predict what they might say if they heard the discussion about left-overs. (It is likely that this discussion about abundance and the need of others will lead to a desire to conserve food.) Probably the idea for making other things from left-overs will be proposed. If it is not you can suggest that the children's mothers may have ways to prepare left-overs in a different way.

In order to involve the parents in this project, there is a model letter provided which can be sent home (page 26).

Arrange bulletin board display for recipes. Print the words RECIPES FOR LEFT-OVERS on the top so children become familiar with them. Have them make folders for each recipe. Each one could draw a picture on the cover and print his name and a title for the recipe. (Potato Surprise, What's In It, etc.) Once the display is arranged, the class could now play a game. They try to guess from the title which left-over is being used. Have one of the cooks from the cafeteria talk to the class about how they use left-overs.

Behavioral Objectives

Children will:

List orally what they think left-over food is. Students will state some reasons why food is left over.

Focusing Questions

What do we mean when we say left-over food? Why is food left on plates? Why do we throw away a little bit? Why do we cook too much?

Behavioral Objectives	Focusing Questions
Explore the idea of abundance bringing about a lack of appreciation.	Suppose you only had a very small amount of food to feed your family. How would you feel about food then? Why would you feel different from people who had plenty of food?
Observe pictures of children (UNICEF, CARE).	What are some things you notice about these children?
Pretend they are the children in the picture.	Pretend you are one of the children in these pictures. How do you think you would feel?
State what they might say if they were there for the discussion about left-overs.	What do you think you might say if you heard this discussion about left-overs?
Propose some solutions to the problem of left-overs.	Think of as many solutions as you can so that we wouldn't have to throw away left-overs?
Give reasons for the solutions they propose.	In what way would that do away with the problem of left-overs?
Take home a letter to parents concerning recipes for left-overs.	
Give titles to their recipes.	What do you think would be an interesting name for your recipes? Think of how it would sound if it appeared on the menu of a restaurant.
Have the class try to guess from the title which left-over is being used.	Now that you have your recipes in folders and titles for them, let's try to guess, from the titles, which left-overs are being used.

Behavioral Objectives	Focusing Questions
Invite the cook from the cafeteria to talk to the class about how they use left-overs.	

Supplementary Learning Experiences

1. Teachers should be encouraged to use this activity with discretion based on the socio-economic background of their children.

2. Have the children role play a scene where they play the role of children from the CARE pictures and children who have an excess of food. Encourage children to verbalize their feelings as they role play different children.

3. Plan an entire meal using only left-over food. The children could fix some of it for their class with the use of a hotplate.

4. Make scrapbooks from magazine pictures of recipes for left-overs; e.g., Tuna-helpers, Hellman's Soups, etc.

*Pictures can be obtained by writing: CARE, Inc., 660 First Ave., New York, New York 10016

Dear Parents:

As part of an Environmental Education Project, the children have been studying the problem of solid waste disposal. One aspect of this problem is left-over foods.

Discussions about our abundance as compared with the need of others have brought the children to the idea of conserving food. They have decided that one good way is to use left-overs in appetizing ways.

Here is where we would like to enlist your aid in two ways:

1. Please talk with your child about the ways you use left-over foods in a variety of ways.

2. Please provide him with copies of simple recipes for left-overs which are original to you. (They cannot be those published by Campbell's, Hellman's, Cookbooks, etc. because we shall display them as originals.) Whenever possible, include the child in the planning of the recipes.

Since this is to be an on-going project, you may continue to send in any original recipes you discover.

Many thanks for your interest and help.

Sincerely,

Content: There are many kinds of solid waste. Different kinds of solid waste may be found at the city dump. Communities often set aside land for the disposal of garbage.

Materials: Transportation to dump. Paper for recording data.

Learning Experience

Introduce the trip to the city dump through class discussion. Take the children to the city dump. The teacher should record all items that were found at the dump (boards, tire, grass) as the children give them. After returning to the classroom, discuss with the children what they saw at the dump. Have them classify items into groups.

Discuss what is done with the garbage after it is at the dump. Explain that this dump is also called a landfill. Talk about the maintaining of landfills. (This idea will be extended in the next activity.) Explain that the city sets aside this land for the final collection of garbage. Talk about how large (area) the dump is. Reason out what will happen over the years as more and more people live in our city and more and more garbage goes to the dump. As the city grows, more area will be needed for garbage disposal. See if children can suggest techniques of finding out whether their city has made plans for obtaining the land that will be needed in the future. (Class could make a phone call or write a letter to city officials. The teacher could arrange to have a city official come to class as a resource person.)

Behavioral Objectives	Focusing Questions
Children will:	
List items they throw away at home.	What kinds of things were thrown away at your house yesterday?
Name the different types of garbage found at the dump.	What kinds of garbage did you see at the dump that we have not talked about before?

Behavioral Objectives	Focusing Questions
Group the different types of garbage according to common characteristics.	Which of the different types of garbage could we group together because they are alike in some way? Why?
Explain how the garbage is piled and covered with dirt to make a landfill.	What happens to all the garbage after it is left at the dump? What else did you see going on there? Why do you think the bulldozer was turning over the land?
Reason out that the city landfill will become larger in area over time.	What will happen to the size of the dump as years go by? As more and more people move to our city?
Suggest appropriate sources for the collection of data to answer a question.	How could we find out if our city has made plans to buy more land to make room for more and more garbage? What person in our city would know about things like that? (Introduce the telephone book as a good source of information.)
Plan questions to ask city official.	What questions would we like the city official to answer for us?

Supplementary Learning Experiences

1. Develop the idea that what is garbage to some is not garbage to others. Ask, "Did you find anything at the dump that you liked or wanted? Then why did someone throw it away?"

2. Have children bring items they no longer use or want (but think someone else might like them) to class. Designate a day as "Swap Day" or "Thrift Day" when pupils can exchange items or items can be sold for a penny or two.

Supplementary Learning Experiences

3. Discuss the negative aspects of the city dump to the people who live near it.

4. Make a simple crossword puzzle using some of the items the children found at the city dump for words.

Content: Man can make use of otherwise wasted land space and reduce the contamination caused by the disposal of solid waste.

Materials: For each group: 1 clear plastic cup, loam, garbage, aluminum foil.

Learning Experience

Review learning experience of the field trip to the dump. Divide class into small groups. Supply each group with clear plastic cup, soil, and garbage. (Include several types of garbage; e.g. paper, food, cloth, bits of metal, pieces of plastic.) Bury the pieces of garbage at different depths against the inner surface of the container so that the children can see what happens. Leave an inch of air space over the firmly packed soil. Keep the soil moist, but not water-logged. Cover each container tightly with a piece of aluminum foil. Set aside a small amount of garbage (including fruit) to decay in a glass without soil. Do not cover. Within a few days mold growth will begin to develop. In 2 weeks decomposition of the garbage will also begin. Each group should observe and discuss the changes in their mini-landfill. Have the class compare their landfills with the uncovered garbage and discuss the advantage of landfill activities.

Behavioral Objectives	Focusing Questions
Children will:	
Construct a mini-landfill.	
Note changes in the garbage and surface of the soil.	What has happened to the garbage and the surface of the soil?
Predict changes in the surface of the soil after decomposition of the garbage.	What will happen to the surface of the soil because of the empty spaces?
Discuss the reasons for landfills.	Why don't we leave the garbage uncovered?

Behavioral Objectives

Focusing Questions

Why do you think we have landfills? Can we build houses or other buildings on the landfill? Why? Why not? How could we use the surface of the landfill?

Supplementary Learning Objectives

1. Introduce and explain the word "incinerators." Discuss the advantages of a landfill over burning solid wastes.
   a. To show what burning does, light a birthday candle and hold a spoon over the candle. Examine the spoon. Ask, "What has happened to the spoon? What caused that?"
   b. Burn a cotton rag, a piece of string, a piece of paper and a peanut butter sandwich over an aluminum pie tin. Hold with a pair of pliers. Keep children at a safe distance. Ask, "Is the smell pleasant? Have the children noticed anyone burning anything in their neighborhood? Does it look or smell good?"

2. Read Wilson's World by Edith T. and Clement Hurd (Harper, New York, 1971), a delightful story of the world as perceived by a boy-artist. The boy sees the world he makes become over-populated and choking in wastes. He rebuilds his world more carefully and shows how a cared-for environment is beautiful.

*The directions for making a mini-landfill are modified from those presented in Teaching Science with Garbage by Albert and Vivian Schatz (Rodale Press, Inc., Emmaus, Pennsylvania, 1971), pp. 14-15.

Content: There are planned procedures for the disposal of solid waste.
Materials: Yarn, construction paper, magazines.

Learning Experience

Design a bulletin board with the children, depicting a flow chart (page 35) showing the steps a useful item follows in becoming solid waste. Trace with the class an item as illustrated below. Food: supermarket - dinner - garbage - dump. As children tell each phase, place a picture of this phase on the bulletin board. Connect the set of pictures with yarn. Divide the class into small groups. Have each group draw or cut from a magazine a picture of something they use (food, clothes, shoes, furniture, etc.). Then have them draw or select pictures that depict the manner in which they used and discarded the product following the model developed with the entire class. Verbally trace the steps these items followed in becoming solid waste. Connect the set of pictures with yarn. Discuss the different ways of transporting the solid waste to the dump. You may wish to add pictures of different means of transporting garbage to the dump.

Behavioral Objectives	Focusing Questions
Children will:	
Trace the steps a useful item follows in becoming a solid waste.	What did _____ look like when it was new? Where did it come from? Where did it go next? (etc. until it arrives at the dump.)
Trace the steps their items followed in becoming solid waste.	What did _____ look like when it was new? Where did it come from? Where did it go next? (etc. until it arrives at the dump.
State how the different solid waste items are transported from their homes to the city dump.	What ways does your garbage get to the dump?

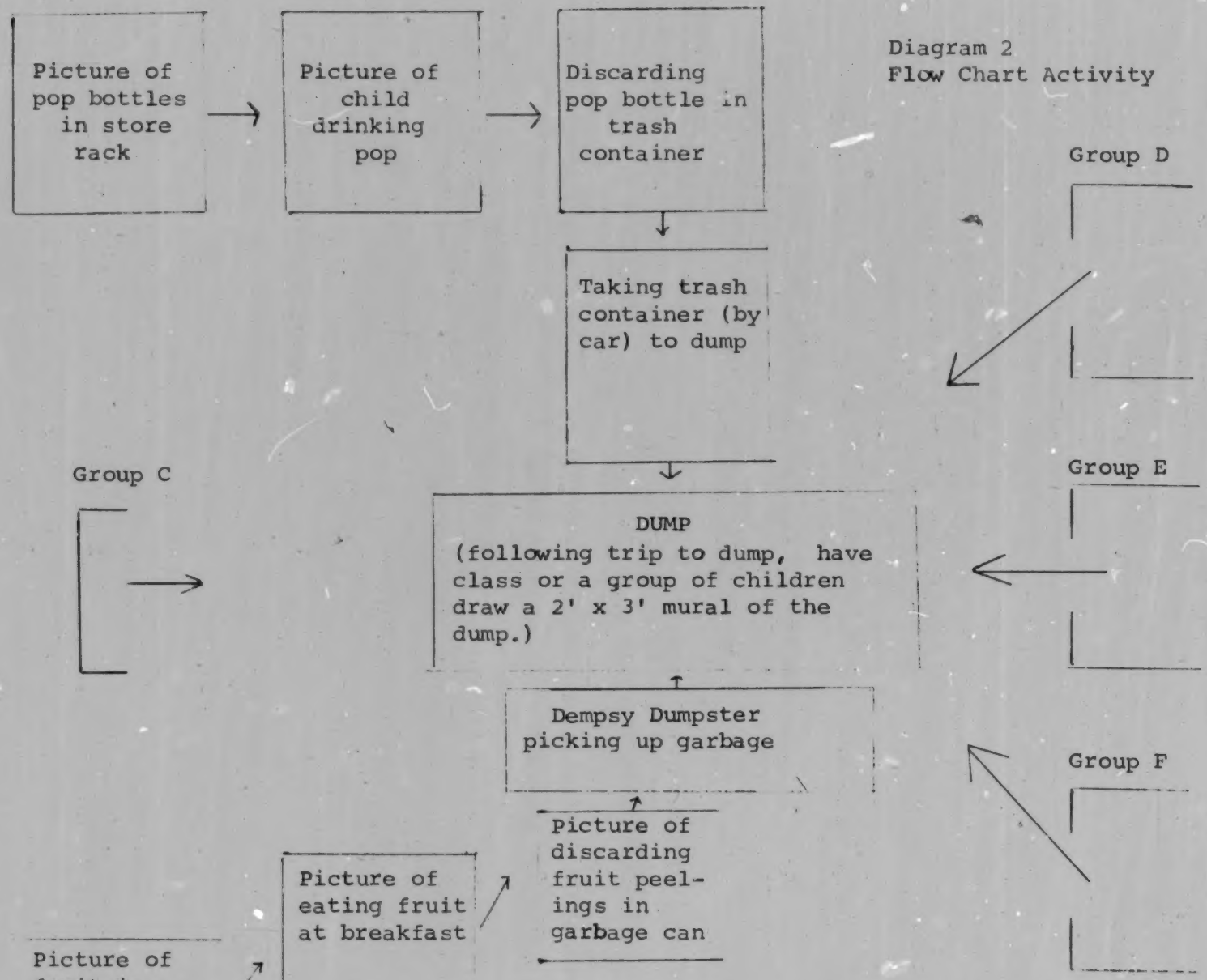
Supplementary Learning Experiences

1. Secure the book, The Steadfast Tin Soldier by Hans Christian Anderson (Atheneum, New York, 1971). This is a story of a tin soldier who gets thrown away and tells of his journey as a piece of solid waste.

2. Have each child pretend he is a certain piece of garbage (of his choice) and write a story telling how he got to the dump.

3. Invite a sanitation department worker to the class to share with children his responsibilities and their importance to the community.

Diagram 2
Flow Chart Activity



*Content of the flow chart is suggestive only

Content: Not all garbage is disposed in a planned manner. Garbage that is carelessly thrown away is often called litter.

Materials: Slides.

Learning Experience

Show slides, or actual examples, of garbage that has been carelessly thrown on the ground (unplanned disposal). Show the slides one at a time and have the children tell what garbage they see, where it is located, and how they think the garbage got there. Ask questions to arrive at the difference between planned and unplanned disposal of garbage. Develop a list of adjectives that describe people who are careless with the disposal of their garbage. Introduce or reinforce the term, litter. Have the children suggest some alternate ways for disposing of garbage.

Behavioral Objectives	Focusing Questions
Children will:	
Identify items of garbage in pictures.	What garbage or trash do you see in the picture?
Use picture clues in determining the location of garbage.	Where is the garbage located?
Hypothesize as to how garbage was left in the various locations.	How do you think it got there?
Compare planned disposal of garbage.	Many people have arranged to have all their garbage taken to the dump. How did people handle the garbage in these pictures in different ways?
Describe people who are careless with garbage (litterers).	Were the people who threw this garbage away careful with the garbage? What words would you use to describe these people?

Behavioral Objectives	Focusing Questions
Name some alternative ways for disposing of garbage.	How might they have taken care of the garbage in a better way?

Supplementary Learning Experiences

1. Have the children draw pictures of their impressions of a litterer. Have the children give their litterer a name and then label their picture. Post these pictures in a place where other children in the school can see them.

2. Discuss the laws and the penalties of the state developed to deal with litterers.

3. Place all the locations where garbage is dumped on a city map. Distinguish in their symbols between the planned and unplanned locations of garbage disposal.

4. Make "Litterbug Litterbags." Use large paper bags (obtainable from grocery store or children can bring them from home). Let children use different colors of cut construction paper to make faces on the bags. Demonstrate how a face can be made to look "happy" when the bag is rightside up (so garbage can be placed in the bag) and "sad" when upside down. Attach litterbags to the front of desks.

Content: Everyone can help in the planned disposal of garbage by not littering.
Materials: Dictated by proposed actions of the class.

Learning Experience

Review the content developed in the previous lessons concerning the problem of solid waste disposal. Discuss with the children the provisions in the school and home neighborhood for assisting people in the disposal of solid wastes (garbage collection, trash cans, waste baskets, etc.). Have pupils recall from their experiences some places around school or in the neighborhood where there is a garbage disposal problem. Discuss actions that can be taken by people to solve those problems. List on the chalkboard the specific actions children suggest. Then consider different means of making people aware of the problems and aware of the need for acting on the problems.

Let the class decide on what action(s) they would like to take to: (1) solve any of the noted problems and/or, (2) make others aware of the noted problems. This means they could select one or more problems to correct or they could develop techniques for public information (poster campaign, bulletin boards, school newspaper articles, public messages over the school intercom, skits or programs to be presented to other classes or at meetings of community organizations, etc.)

Note: The teacher may wish to arrange a way by which pupils' actions can be made public. For example, a newspaper article.

Behavioral Objectives

Children will:

Recall items of content from previous lessons.

Name ways by which the school or community plans for the disposal of garbage.

Focusing Questions

What have we learned about garbage and garbage disposal?

How do the school and the community provide for garbage disposal?

Behavioral Objectives	Focusing Questions
Recall areas of the school and/or community where garbage (litter) constitutes a problem.	Can you think of any places around the school or neighborhood where garbage (litter) is a problem?
Propose human actions that will alleviate the noted problems.	What can people do to correct those problems?
Propose techniques they could employ to make people aware of littering.	What could we do to help people see the problems? What could we do to get people to do something about these problems?
Select and employ a type of action that will help solve a garbage disposal problem.	Which of these problems would you like the class to consider? What will we do, as a class, to solve this problem?

Supplementary Learning Experiences

1. Have the children write essays of appeals to the public not to litter. See if you can get some of them published in the local newspaper.

2. Have the children write down their feelings about littering in the form of slogans, mottos, or messages and see if they can have them broadcast on the local radio station.

3. Read and discuss the book, For Pollution Fighters Only, by Margaret Oldroyd Hyde (McGraw-Hill, New York, 1971). The book challenges young people to fight pollution with suggestions on how to organize community awareness action programs.

Level 3: Eight Year Olds
Theme A: Man and the Land

INSTRUCTIONAL MODULE 3A

INTERDEPENDENCE IN THE ENVIRONMENT

MODULE GENERALIZATION: Elements of the natural environment are interdependent.

These materials were developed by the Primary Environmental Education Project of the University of Georgia under a grant from the U. S. Office of Education (Project No. OEG-0-72-5121). All publication rights reserved.

1973

Preface

The purpose of the Primary Environmental Education Project of the University of Georgia was to develop and field test nine instructional modules designed as supplementary material for a primary grades social studies program. The modules focus on teaching/learning activities that will build an understanding of the interrelationships between man and the land, water, and air. In the construction of the modules primary emphasis was given to the thinking processes of young children and the provision for many opportunities to engage in creative thinking.

Project personnel are: Everett T. Keach, Jr. and Elmer D. Williams, Co-Directors; Cheryle Johnson and Ann McCarthy, Research Associates; Marie Banks, Faye Jenkins, Carole May, and Vickie Spence, Clarke County Public Schools, Project Associates; Agnes Amos, Dycie Campbell, Judy Carter, Aurelia Fraley, Evelyn Griffin, Thelma Hurley, Margaret James, Dorothy Keach, Faye McKinney, Virginia Rogers, and Marty Shirley, Project Teachers, Clarke County Public Schools; Elizabeth Acheson, Frank Golley, E. Paul Torrance, and William Zeitler, University of Georgia, Project Consultants.

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Cover design by Sherri Hardeman, a primary level pupil at Oconee Street Elementary School, Athens, Georgia.

REQUIRED MATERIALS

Throughout this module, a variety of materials and/or arrangements will be required. Some of these may take some time to secure. Provided below is a sequential listing of the needed materials.

1. Chart paper
2. Lists, groups, labels developed in previous lesson
3. Pencils and pads (each child)
4. Set of encyclopedias, library books on animals
5. Pencils, pads, plaster of paris
6. Charts from previous lessons, paper for large wall mural, sheets of neutral-colored construction paper, paints, brushes, water tins, etc.
7. Yarn, name tags of animals, set of encyclopedias, drawing paper
8. Mural developed in number 6 above
9. Wide-mouthed jar or aquarium, small saucer of water, spade, plastic bags, bucket, paper, gravel or sand, charcoal
10. Paper, crayons, experience chart paper
11. Plants Grow by Thomas E. Tinsley, Jr. (G. P. Putnam's Sons, New York, 1971)
12. Dictated by courses of action selected by pupils

Level Three: Eight Year Olds
Theme A: Man and the Land
MODULE GENERALIZATION: Elements of the natural environment are interdependent.

Content: Our environment is the total of all the conditions, circumstances, and influences surrounding us.
Materials: Classroom, chart paper.

Learning Experience

The first two levels of this module have dealt with the environment, but until now, the word itself has never been introduced. In this lesson it will be.

Have the children spend a few minutes observing their surroundings. You might have them use their senses in this manner: looking, handling things around them, listening to the sounds of the classroom, and smelling the room (Different parts of the room may have very different smells; e.g., the corner where plants grow, the lockers where gym shoes are kept.)

Have the children enumerate and classify the things which make up their classroom. In order to make it possible to continue the lesson at another time, it is preferable to do the listing on chart paper that can be put aside until the next day. However, it would be preferable to do the listing and classifying both in one lesson to get to the word "environment."

After the discussion about the classroom, briefly summarize what the class has said and introduce the term, environment. Print the word in large letters over the listing or category labels where all the children can see it.

Note: If the children are perceptive, they will list other children as part of their environment. This leads to the idea of the environment of the individual child as well as the environment of the population of children (the class).

Behavioral Objectives	Focusing Questions
Children will:	
Enumerate the things which are in the classroom.	Take a few minutes to look around you and notice as much as you can about your surroundings. What are some of the things you (see, feel, hear, smell) that are a part of our classroom?
Group according to common characteristics those things which make up their classroom.	Which of these things that make up our classroom could we put together because they are alike?
Give reasons for grouping.	Why do you think they belong together?
Label groups.	What name could we give this group?
Give reasons for labels.	Why do you think that would be a good name?
Make statements summarizing the discussion on the classroom.	What statement could you make that would bring together all our ideas about what a classroom is? We sometimes call that by another name - ENVIRONMENT.

Supplementary Learning Experiences

1. Have children list and describe other environments of themselves or their families.

2. Begin a class dictionary containing words learned during their study of the environment.

Content: Some changes can be made in the environment.
Materials: Lists, groups, labels from previous lesson.

Learning Experience

For the discussion about changes in the environment of the classroom it might be helpful to group the class in fives and let them plan some changes they would make. Before dividing into groups be sure to explain that each group will report to the class what they have discussed.

When the groups report, get a record of changes they would make (use chalkboard). Discuss with the class how these changes would affect the classroom environment. Then, keeping these effects in mind, have them decide on the "best" improvement. When they have chosen, ask them to brainstorm in small groups about ways to "sell" their idea so that they will be able to make the change. We would like the children to be able to draw warranted conclusions about changes in the environment. Some changes they propose will be possible; some may be possible under certain circumstances; and others will not be possible. For discussion purposes, try to choose samples of each type.

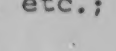
Ask the children to summarize the discussion first. Then have them draw some conclusions about changing the environment. Give all the children a chance to write a few ideas and have as many as possible share their conclusions with the class.

Behavioral Objectives	Focusing Questions
Children will:	
Suggest ways to change the environment of the classroom.	We have been talking about our classroom as an environment. Suppose we did not like it as it is. What are some things we could do to change the environment?

Behavioral Objectives	Focusing Questions
Explain how these proposed changes would affect the room environment.	If we move desks out, make the room larger, put in more windows, get a new teacher, etc., what effect would this have on the classroom environment?
Choose what they consider the "best" improvement.	We have talked about these changes and the effect they would have. Suppose we were going to be permitted only one of our suggested improvements. Which one do you think would be the best? Suppose now that it's up to you to "sell" your idea about the improvement. What would you do to get others to see it the way you do?
Classify proposed changes as POSSIBLE or IMPOSSIBLE.	Looking at the proposed changes, which ones are POSSIBLE? Which are IMPOSSIBLE?
State necessary conditions for changes to be POSSIBLE.	Suppose we did decide to (make the room larger) what would have to happen before we could make that change?
Give reasons for their responses.	Why do you think it would be necessary to (have principal's permission)?
State why they think some changes are IMPOSSIBLE.	What makes you think that making the room larger is IMPOSSIBLE? (Because it would be too expensive, because there is a class on the other side, etc.)
State conclusions about changing the environment based upon the discussion.	From what we have said about changing our environment, what could you say about it in one sentence?
Cite support for concluding statements.	What did we say here that would lead you to think that?

Supplementary Learning Experiences

1. If feasible, carry out one of the changes in the classroom environment proposed in the lesson.

2. Using box tops of different sizes and shapes as the classroom floor plan, arrange the furnishings of the classroom (cardboard or construction paper cut-outs of desks, chairs, tables, etc.; e.g., ) for the most appropriate use of space.

3. Invite principal or building superintendent to class to discuss proposed changes. He could explain why some are impossible, others difficult, etc. It might help them to understand some of the necessary steps needed to change parts of the school environment.

Content: The environment of a nature area is the total of all the conditions, circumstances, and influences surrounding the area.

Materials: Nature area near schoolgrounds (front lawn, plot of ground, etc.), pencils and pads.

Learning Experience

Have the class briefly recall the lesson on the meaning of ENVIRONMENT. Explain that they are now going to take a walk outside to visit a different environment.

Direct the children to take note pads and pencils with them to make a list of all the things they can see outdoors.

When the class returns, compile a composite listing under a title, THINGS WE COULD SEE. Keep the listing, groups, and labels for use at another time.

Behavioral Objectives	Focusing Questions
Children will:	
Visit an outdoor site.	We have looked at the things that make up our classroom environment. Now we are in a different environment.
List all the things they see in the outdoor site.	What are some of the things you see in this environment?
Identify differences between their classroom environment and their outdoor environment.	What are some of the things about this environment that are different from our classroom environment?
Group things they could see in the environment outside.	Among the many things you could see in the environment outside, which would you group together because they are alike?
State reasons for groupings.	Why do you think so?

Behavioral Objectives	Focusing Questions
Suggest a variety of labels for groups.	What name could we call this group of things we saw in our outdoor environment?
State reasons for labels.	Why do you think that would be a good name?

Supplementary Learning Experiences

1. Have children write letter(s) requesting promotional material on birds and animals to: National Audubon Society, 1130 Fifth Avenue, New York, N. Y. 10029.

2. Have the children tape record sounds of the classroom, cafeteria, playground. Then have them tape the sounds of the nature area. Play them back and have them compare the two kinds of sounds.

3. Have children look through their social studies and science books to locate pictures of outdoor environments found in other countries or areas of the world.

Content: All animals need food in order to survive.
Materials: Set of classroom encyclopedias, library books on animals. (The teacher may wish to utilize the school library for the data collection stage of this lesson.

Learning Experience

Have the children recall animals (or evidences of animals) they saw in the school's nature area. Explain that the animal kingdom includes insects. Make a list of their responses on the chalkboard. Be sure that each animal pictured in Diagram 2 on page 20 is included in the listing. Have the children add to the list focusing on animals common to this area. The teacher may also add some animals the children did not think of. Try to have as many animals as there are children in the class. Title the listing (see Diagram 1).

Then let children tell what they think each animal eats (their food sources). Place responses in the second column. If pupils have no idea of what an animal eats, skip on to the next animal. Explain that this completed list only represents what **we** think the animal eats. Then ask for suggestions as to how the class could go about finding out if their hunches were actually correct.

Assign animals to pupils (accommodate individual interests to the extent possible). Each child can be a different animal if this is possible. Other wise, two or three children can be the same animal. Explain that while they are reading to find what their assigned animal eats they are to also see if anything eats their animal. Tell them that an animal that eats other animals is sometimes called a "predator." Allot time for children to use resource materials to find the food sources and predators of the animals. Later complete the third and fourth columns of the chart.

Once the chart is completed, ask questions to help children draw generalizations from the information. Transfer the chalkboard chart to chart paper in order to save the information for use in the concluding lesson of this module.

Learning Experience

Note: This lesson requires children to collect and chart data about animals. While this is being done, you might begin the next lesson since both lessons are closely related.

Behavioral Objectives	Focusing Questions
Children will:	
Name animals they might have seen on their study trip of the school nature area.	What animals did you see when we explored the nature area of our schoolgrounds?
Name what they think each animal eats.	What do you think these animals eat?
Suggest and utilize appropriate resources for verifying the food sources for listed animals.	How could we find out if our ideas about the foods the different animals eat are correct?
	What does your animal eat? (After data collection.)
Verbally generalize using information from chart.	What does the chart show us about a need of animals?

Supplementary Learning Experiences

1. Read the book, Be Nice to Spiders, by Margaret Bloy Graham, (Harper, New York, 1967), a brief appealing story of a spider's role in insect control; or Who Goes There in My Garden by Ethel Collier (Scott, New York, 1963), an examination of the ecological role of animals and insects in the environment of a child's own garden.

2. Make charts of other characteristics of the animals considered in this lesson: e.g., size, habitats, coloring, etc.

Diagram 1

	Animals	What We Think They Eat	What They Do Eat	Does Anything Eat Them?
1.	squirrel			
2.	mouse			
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				

Content: The environment of a nature area is the total of all the conditions, circumstances, and influences surrounding the area.

Materials: Nature area near schoolgrounds, pencils, pads, plaster of paris for molds.

Learning Experience

Briefly review with the class the previous visit to the outdoor environment and why they went there. Have them predict what things might be in that environment even though the students may not be able to see them. Make a list of their predictions.

Explain to the class that now, like detectives, they will take a trip outside to look for clues that tell them what things are there that they could not see. When you return to the class after this activity, refer to the list of predictions previously made. Add to the list as the children share their observations.

Some children may find animal tracks in the area. Provide them with plaster of paris for making molds to display in class. If several children are going to do this, assign to each one a small group who will observe the activity, thereby giving everyone the opportunity to take part.

Behavioral Objectives	Focusing Questions
Children will:	
Recall their visit to a nature area.	What do you remember about our trip outdoors to a different environment?
State predictions about things they could not see in that environment but that probably exist there.	Think for a few minutes about the outside environment we visited. There were many things we could see there. What are some other things that might be there that we could not see?

Behavioral Objectives	Focusing Questions
Give reasons for their predictions.	Why do you think (worms, squirrels, birds) are probably there even though we could not see them? What might tell you there were (worms, squirrels, birds) there even when you could not see them?
Recall clues they found of things that could not be seen.	What were some clues you found that told you some things were there although you could not see them? In what way did that tell you they (worms, squirrels, birds, etc) were there? What is the environment of the (worms, squirrels, birds)?

Supplementary Learning Experiences

1. Begin file of mounted pictures and newspaper clippings. Class could gather pictures, mount them, and then classify them for filing in alphabetical order. They could also begin an index card file describing the pictures and clippings.

2. As children examine different plaster of paris molds of animal tracks they will notice that animals have feet of different sizes and shapes. Read the book, Animal Feet, by George Frederick Mason (Morrow, New York, 1970) to the class. It emphasizes the importance of feet in the adaptation of many animals to their environment.

3. Discuss with the class the color of the birds and animals in different outdoor environments. Explain what is meant by "protective coloration."

Content: The environment of a nature area is the total of all the conditions, circumstances, and influences surrounding the area.

Materials: Charts of previous lessons, paper for wall mural, and individual sheets of neutral-colored construction paper, paints, brushes, water tins, etc.

Learning Experience

In this lesson the class will create a mural depicting the nature area they have seen and talked about. The paper for the mural should be long enough to cover a good bit of wall space. You or a small group of children should paint on it a horizon, clouds, etc.

Have each child draw, color, and cut out the object(s) he "saw" in the nature area. Children then arrange them on the mural to create a picture of the nature area. Attach the pictures with pins, tacks, staples, etc. so that they can be removed easily.

While the children are working, check to see if some aspects of the nature area are not being included in their drawings. Suggest to them that they refer back to the lists they made of things they saw. Have extra materials available so that children may do more than one.

Behavioral Objectives

Children will:

Create a model of the outdoor environment as they recall it from their field trip.

Focusing Questions

Let's look back over the lists of things we saw and the things we could not see but we knew were there. Close your eyes for a minute and think of what the outdoor environment looked like. Now let's put that picture on your paper.

Supplementary Learning Experiences

1. Read to the class the story *Farewell to Shady Glade* by Bill Peet (Houghton-Mifflin, Boston, 1966). This story gives children the opportunity to examine interdependence among several life-forms including humans.

2. Write to or have the children write to: National Wildlife Federation, 1412 Sixteenth St. N. W., Washington D. C. 20036 for catalogs of publications. Games and multimedia packages are available at little or no cost; e.g., Bird and Animal Jigsaw Puzzles, Wildlife Lotto, etc.

Content: Elements of an environment are interdependent.
Materials: Yarn, name tags, drawing paper, set of encyclopedias.

Learning Experience

Prepare name tags for each of the pictures in Diagram 2. Designate individual pupils to represent the several items. Pin name tags on pupils. Arrange pupils in a circle. Using previously learned information on the food sources of animals, begin with one animal. For example, ask "Where does the rabbit obtain his food?" "Do any of the other animals eat rabbit?" Use yarn to make visual connections between any animal-animal or animal-plant relationships. Since rabbits eat plants, wolves eat rabbits, and owls eat rabbits, yarn connections between rabbit-plant, rabbit-wolf, and rabbit-owl would be made.

Continue developing relationships for each listed item with yarn until all items have been considered. The result will demonstrate a food web with multiple relationships. Develop the term "Food Web." (Note: Have a set of encyclopedias handy in case any quick reference work must be done.)

Then return to an examination of the rabbit's part in this food web. Ask questions to help children understand that if one element of the web is changed other relationships (yarn connections) of the food web are affected. For example, "What would happen if hunters killed all the rabbits?" At this point disconnect all the yarn connections that would be affected were there no rabbit in the food web. Restore the rabbit relationships to the food web and then explore what would happen if another element of the web were to change in any way. Remember that it is not always a matter of the item being deleted. For example, "What would happen if the deer population were to double?" A possible response might be, "The plant coverage of the soil could be entirely eaten by the deer." The teacher might then respond by asking, "What would the other plant-eating animals then do for food?"

Learning Experience

Note: If some children require more activity, develop a bulletin board food web at the same time. A blank bulletin board, a box full of arrows cut out of construction paper, and the figures from the mural will be needed. A child can take the figure of the living thing from the mural, put it on the bulletin board, and tack on the arrow at the same time it is being done by the others with the yarn.

Continue examining different items of the food web until you are sure students understand the content objective of the lesson. Depending on the ability level of the children, the teacher might have pupils pick any animal and draw a simple food web that includes that animal.

Behavioral Objectives	Focusing Questions
Children will:	
Name the food sources of selected animals.	Where does the _____ obtain his food?
Name predators of animals.	Does anything use the _____ for food?
Make yarn connections between inter-dependent elements.	What should we connect with the _____?
Verbalize relationships in the food web.	What might happen if hunters killed all the rabbits? (One example)
Draw a food web.	Pick an animal and draw a food web that includes the animal.

Supplementary Learning Experiences

1. Have children make puppets of the animals they have listed. They could then act out a puppet show depicting what happens in the food web.

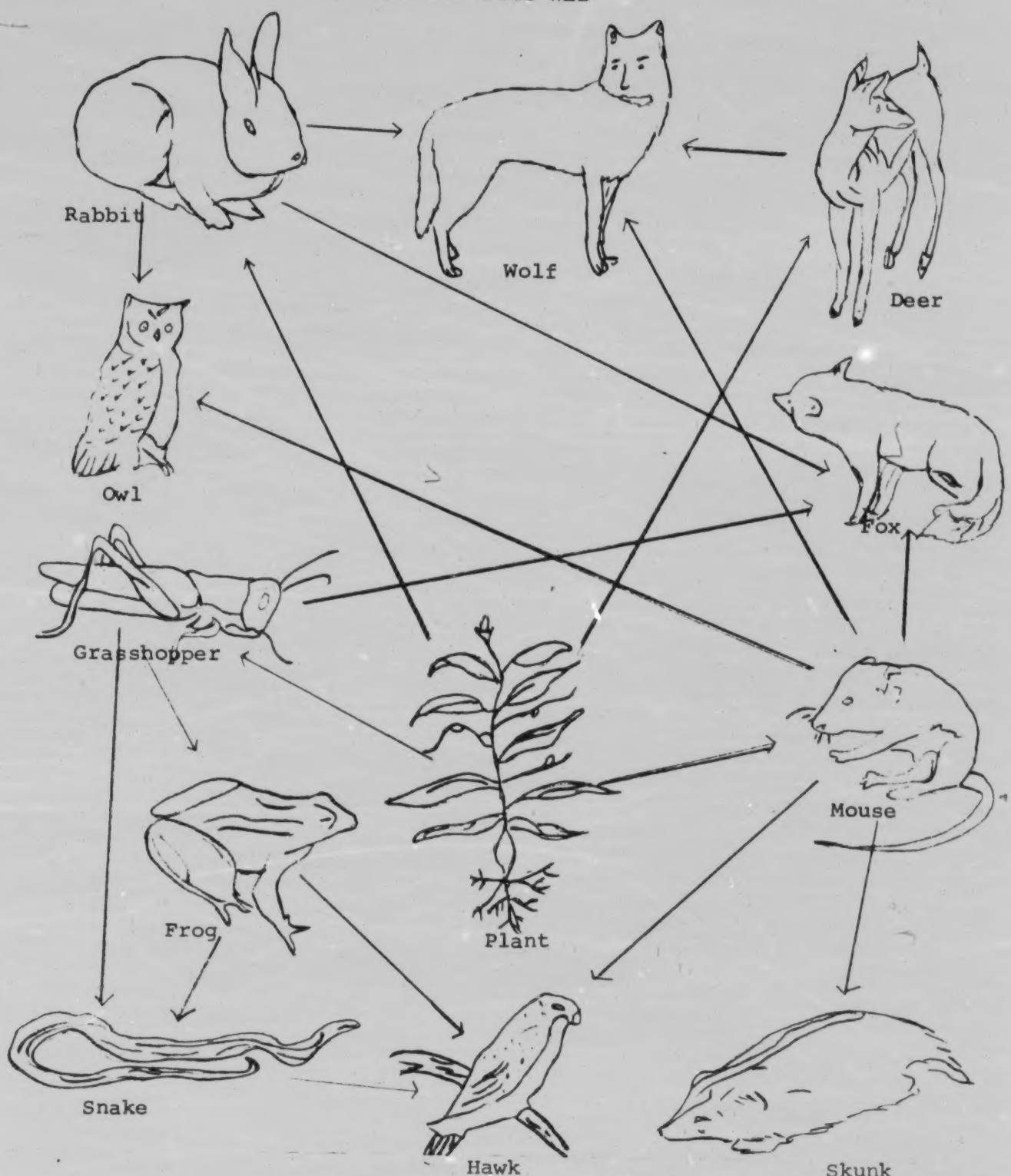
2. Determine how man is dependent on the animals in the food web developed in this lesson. Then do research to find out how man is dependent on other well-known animals; e.g., cows - milk and meat, cats - pets and pest control, etc.

3. Discuss different ways humans are dependent upon one another.

4. Make a list of some animals directly harmful to man.

Diagram 2

A POSSIBLE FOOD WEB



⟶ = Eaten By

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Content: Changes in one element of the environment affect other elements of the environment.

Materials: Class mural developed in previous lesson.

Learning Experience

The teacher's objective is to show the potential effects of environmental changes. This can be done effectively by pointing out specific items drawn in the class mural and then exploring what the mural picture would be like if that item were taken out or if more of the item were added.

For example, the teacher might first point out the trees in the mural. After children name the item being pointed out, she would then ask, what might happen if the trees were all cut down or died as the result of a disease? (Since items are attached to the mural, the teacher may wish to actually remove any example(s) of items as they are discussed.) As questions such as this are somewhat open-ended, several responses may be acceptable. For example, "Some birds might not have a place to build their homes." "There would be no more dead tree leaves to add nutrients to the soil." "Some of the soil might wash away during a heavy rain." etc. The purpose here is to help students understand dependencies between different elements in this environment. Ask pupils to make statements about the desirability/undesirability of each environmental change they discuss. Use this general procedure with other items pictured in the mural. Children could take turns pointing out items in the picture for the class to discuss.

Help students generalize by asking such questions as, "What happens when you change one part of the environment (mural picture)?

Behavioral Objectives	Focusing Questions
Children will:	
Explore the consequences of different changes in the environment of the school nature area.	What might happen if the _____ were no longer in the nature area? (Follow through all possible consequences.)

Behavioral Objectives	Focusing Questions
Evaluate the desirability of consequences of environmental changes.	If that happened, would it be a good or bad thing? Explain what you mean.
Generalize that changes in one element of the environment often affect other elements of the environment.	What happens when some part of the environment changes or is changed?

Supplementary Learning Experiences

1. Read the story, Once There Was a Tree by Phyllis S. Busch (The World Publishing Company, Cleveland, 1968). This book relates how a tree changes during its life cycle, as well as its effects on living things in the immediate surroundings.

2. Each child uses an animal that he has been collecting information about and tells or writes a short story of what could happen if he and his species were to become extinct. Explain the word extinct.

Content: Plants and animals are interdependent within an environment.
Materials: Wide-mouth jar, small saucer of water, spade, plastic bags, bucket, paper for log. Items to be collected: 1. gravel or sand, 2. charcoal, 3. wood soil-humus, 4. small plants or tree seedlings, 5. large jar or terrarium container.

Learning Experience

Bring the outside environment indoors by building a terrarium. Equip the class with a spade, a bucket, and individual plastic bags (sandwich bags are adequate) and collect materials. Tell students to put the plants and seedlings they find in the plastic bags surrounded by soil to protect the roots. Some available plants might be: partridge berry, wintergreen, mosses, ferns, lichens, violets. Place their collected items and other materials listed above on a table in the classroom. (You will need to find the materials listed above prior to the lesson.)

In building a terrarium any large jar or aquarium tank can be used for a container. The bottom of the container should be covered with 1½ inches of sand or coarse gravel for proper drainage. Several small pieces of charcoal should be buried in the sand or gravel to absorb gases and keep the soil from souring. The layer of soil should be 3" or 4" deep. The soil should be rich but not so rich that the plants will grow too fast. Add several small plants to the soil. Ferns and different types of vines are good plants for a terrarium. Cover the remaining soil with moss. Sink a small container of water in the soil to serve as an artificial pond (a jar lid). Sprinkle the ground until moist, but be careful not to leave it so moist that mold will develop. Stones can be added to give the effect of boulders and a piece of lichen-covered bark can serve the purpose of a log. Observe from day to day the growth of the plants. Upon observation, lead the children to observe any defects within the terrarium. If there are any defects, correct them as a class.

If possible, later add a few animals or insects to the terrarium: snails, lizard, frog, grasshopper, beetles, caterpillars. Observe from day to day the animal's activities within the terrarium. Since the children will be observing the terrarium daily, the children can take turns filling a daily log of the changes within the terrarium.

Behavioral Objectives	Focusing Questions
Name things that could be placed in a terrarium.	We're going to create an environment in this container. Does anyone know what this environment is sometimes called? (terrarium) What do you think we will need to make this environment (earth, plants, animals)?
Determine where items for the terrarium can be found and collect several of the items.	Where would we find these things?
Decide the order in which elements will be put in the terrarium.	Of the materials on the table, which do you think we will put in our terrarium first? Why? (Continue through in this manner. If the students do not know, tell them and explain why.)
Observe the plant growth within the terrarium.	Do you notice any changes in the plants within the terrarium? What do you think caused these changes?
Observe any defects there may be within the terrarium.	Do you see anything within the terrarium that may hinder the growth of the plants?
Correct any defects within the terrarium.	How can we change the terrarium to correct these problems?
Observe the animals' activities within the terrarium.	What are the animals doing in the terrarium? How has the terrarium changed since we added the animals?
Write a daily log of changes in the terrarium.	How might we keep a record of what happens in the terrarium? (Ask right after terrarium has been finished.)

Supplementary Learning Experiences

1. Use the list of environmental vocabulary that has been added to the dictionary of words about the environment and cut out the letters of the words. Put each word in a separate envelope which is color-coded. The children will work with the letters until they have formed a word. Provide a color-coded answer key to let them know what the word is.

2. Make a small terrarium of another environment; for example, a desert environment.

Content: Man can build environments.
Materials: Paper, crayons, experience chart sheet.

Learning Experience

Many children may wish to make a terrarium at home. Have the children list the steps necessary to construct a terrarium and review the purpose of each step. 1. gravel or sand 2. charcoal 3. soil 4. plant plants 5. cover area with moss 6. sprinkle with water 7. place interesting rock 8. cover container with glass or plastic cover (keep out of hot sun).

Divide the class into 8 groups. Assign one step to each group. Explain that each group is going to make part of a booklet explaining how to make a terrarium and that they will be able to take a completed copy of the finished booklet home. Each group will need to delineate responsibility within the group to accomplish: a picture describing the step assigned the group, and a short phrase or two explaining what they are doing in the step. Each group does its work on a sheet of 8½" x 11" paper. When the group is satisfied with its picture and writing, it can trace the page on a sheet of ditto (duplicating) master. When each group is finished, the class must decide how to number the ditto pages. Run off copies. Some children may wish to color their booklets before taking them home.

Behavioral Objectives

Children will:

List the steps in making a terrarium.

Draw and label one step in making a terrarium.

Focusing Questions

What is the first step in building a terrarium? Why do we put in gravel or sand as the bottom layer of the terrarium? (Continue through all of the 8 steps.)

Supplementary Learning Experiences

1. Have children check with their families and friends to find out how many have terraria in their homes. They might be interested in beginning some and the children could help by lending their booklets of directions.

2. Add to the class library Who Goes There in My Garden by Ethel Collier (Scott, New York, 1963). In the small environment of a child's own garden, the ecological role of animals and insects is introduced.

Content: Plants need food (nutrients). The nutrients may be derived from many sources. Man can add nutrients to the soil to aid plant growth. In nature areas food for plants comes from the environment of the plants.

Materials: Plants Grow by Thomas E. Tinsley, Jr. (G. P. Putnam's Sons, New York, 1971) or other suitable material.

Learning Experience

Begin by recalling different kinds of plants seen in the school nature area.

Ask the children if they've ever seen anyone "feeding" plants. Do plants need food? How could you "feed" a plant? Have any of you seen your father put leaves, packages of soil purchased at a hardware store or garden shop, or fertilizer in soil used for growing plants? After a discussion of ways man can add plant nutrients to the soil, ask the class how plants in the school nature area get their food since man does not add nutrients to that soil.

Read from a children's book on plants a description of how and where plants get their food nutrients. One such book is Plants Grow by Thomas E. Tinsley, Jr. (G. P. Putnam's Sons, New York, 1971), pp. 1-37. Explain to the class that they are to listen for descriptions of where plants get their nutrients. Following reading, structure the discussion around the content objectives listed above. Some of the sources of plant nutrients that might come out during the discussion include (1) minerals from soil and water, (2) fertilizers added by man, (3) food stored in the seed or roots, etc. See if students can come up with several means by which man could add nutrients to the soil for plants (commercial fertilizers, adding dead leaves, watering, etc.).

Behavioral Objectives	Focusing Questions
Children will:	
Identify different types of plant growth observed on the school nature area.	What different types of plants did you see growing in our nature area? (grass, bushes?)

Behavioral Objectives	Focusing Questions
Name some ways plants can be "fed" by man.	How might you "feed" a plant?
Listen attentively as material is read to them.	What do plants need in order to grow?
Recall information presented during the reading.	Where and how can plants get the nutrients they need for growth?
Name ways man can provide nutrients for plants.	What could man do to help provide nutrients for plants?

Supplementary Learning Experiences

1. Set up several jars of water colored with vegetable coloring (blue, green, red, etc.). Place stalks of celery in the jars. In a few hours, the leaves will begin to show traces of the colored water. Discuss with the children the way the plant is "fed" by water.

2. Bring empty plant fertilizer bags to school. Make a list of the chemicals that are found in the fertilizers. Try to find out the functions of the various chemicals.

Content: People can assist a food web.
Materials: Dictated by courses of action selected by pupils.

Learning Experiences

Lessons of this module have emphasized interdependence in the environment. The food web was one example of such interdependencies. In this concluding lesson the teacher will focus class activities on the means by which people can assist a school's nature area (emphasis being on land).

Begin by reviewing the food web. Display chart (Diagram 1) from previous lesson. After students name some of the animals on the chart that they included in the school's nature area, ask, "What do these animals need to continue living in the nature area?" (Be sure some of the necessary food sources are discussed.) Then ask students to recall the activity in which yarn connections were made between living things in the food web. "What happened when things were removed from the food web?' Then move to a consideration of the food web relationships in the school's nature area. Ask, "Could this food web be harmed in any way? Could it be helped or supported in any way? Could we as a class do anything to help the nature area or prevent it from being harmed?" Lead a discussion of what they might do for the nature area. (Examples: provide food and/or shelter for animals in case of bad weather, plant bushes or trees that will bear fruit that some animals use for food, clean out litter, put up signs to make people aware of areas that should not be tampered with, develop means of preventing erosion in areas that are being washed away, etc.)

The class will then select one group project and carry it out. As the group project is being conducted, help children see how some of these activities would be helpful in their home environments. Encourage individual projects that will support the food web as it may exist around their homes.

Behavioral Objectives	Focusing Questions
Children will:	
Review chart on animals in the natural environment and what they eat.	Let's look again at the chart we made in another lesson. What animals did you say could be found in the nature area here? What are some of the things they need to continue living here?
Recall interdependencies in the food web.	When we removed (berry bushes, birds, trees) from our picture, what happened?
Consider the food web of their own nature area.	How could the food web in our nature area be harmed? How many ways can you think of that our nature area could be helped?
State alternatives for supporting the nature area.	In what ways could we, as a class, do something to help the nature area? In what ways could we prevent it from being harmed?
Select a class project.	Out of the many ideas you have mentioned, which of these could we do as a class project?

Supplementary Learning Experiences

1. Have children make costumes representing some ecological phenomena; e.g., rivers, smoke, leaves, trees, etc. They could use wrapping paper as the base and draw and color on it. You might give a prize for the costume that best represents the idea. (Be sure that they are made in school so that they will be done only by the children.)

2. After the children have decided on a class project, suggest to them that small groups or individuals might act upon some of the other projects that were proposed.

Level One: Six Year Olds
Theme B: Man and the Water

INSTRUCTIONAL MODULE 1B

WATER - SUPPORT FOR MAN'S ACTIVITIES

MODULE GENERALIZATION: Water provides support for man's activities.

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1973

Preface

The purpose of the Primary Environmental Education Project of the University of Georgia was to develop and field test nine instructional modules designed as supplementary material for a primary level social studies program. The modules focus on teaching/learning activities that will build an understanding of the interrelationships between man and the land, water, and air. In the construction of the modules primary emphasis was given to the thinking processes of young children and the provision for many opportunities to engage in creative thinking.

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Cover design by Sherri Hardeman, a primary level pupil at Oconee Street Elementary School, Athens, Georgia.

REQUIRED MATERIALS

Throughout this module, a variety of materials and/or arrangements will be required. Some of these may take some time to secure. Provided below is a sequential listing of the needed materials.

1. Magazines, construction paper, paste, scissors

2. Several packages of pre-sweetened Kool-Aid, paper or plastic cups, water pitchers (one per every 7 or 8 children)

3. Two oranges, two tomatoes, two potatoes, three plastic containers, three clear water glasses, strainer, masher, cutting knife

4. Containers of fish products, large map of United States, circles made of colored construction paper

5. Mung beans, loam soil, milk cartons, water

6. Materials for hydroponic garden (see pages 13 - 15)

7. Soap, water

8. Large sheet of construction paper

9. Large map of Georgia

10. Drawing paper, crayons, pictures showing people using water for recreation, <u>One Morning in Maine</u> by Robert McCloskey (Viking Press, New York, 1952)

11. Clay, milk cartons, water, pencils or popsicle sticks

12. Aquarium, sand, plants, guppies, filter, aerator, heater, fish food

13. Experience chart paper, various art materials

Level One: Six Year Olds
Theme B: Man and Water
MODULE GENERALIZATION: Water provides support for man's activities.

Content: Water is used by man in many ways.
Materials: Numerous magazines for clippings, scissors, construction or poster paper, paste.

Learning Experience

Children are to first go through magazines (have enough for at least one per child) to find examples and uses of water; e.g., lakes, rivers, people drinking water, etc. After children have cut out all appropriate pictures, divide the class into groups of five. Children of each group combine their pictures. Each group lays its pictures on a table. The teacher then tells groups that they are to divide the pictures into sets (groups) on the basis of things pictures have in common. As they work in their groups at classifying the pictures, children are to explain to the group the reasons for putting pictures together. As the students are working, the teacher should move from group to group. As groups finish, the teacher helps each group come up with labels to describe the different sets of pictures. On a large piece of construction or poster paper, the teacher then writes the labels of the picture groups. The student groups then paste pictures under the appropriate labels. Display the posters in the classroom. After posters are displayed, ask children to make verbal statements concerning what they've found out about water.

Behavioral Objectives	Focusing Questions
Children will:	
Identify examples of water and water uses.	Go through your magazine and cut out examples of water and man using water.

Behavioral Objectives	Focusing Questions
Group pictures according to common characteristics and give reasons for groupings.	Which of the pictures could you put together because they are alike in some way? Why are they alike? In what ways are your picture groups different or not alike?
Label groups of pictures and explain their bases for the labels.	What name would you give this group? Why is that a good name for these pictures?
Match pictures with category labels.	Which pictures would you paste under this name?
Make concluding statements of individual learnings.	Based on what you've just done, what can you say about water?

Supplementary Learning Experiences

1. Place a clear glass filled with water on an empty table or desk. Have children suggest words to describe the water. Bring in such things as how it feels, looks, tastes, sounds, and smells.

2. Have children collect samples of water from different places; e.g., rain water, faucet water, water from different creeks or rivers, water from a mud puddle, etc. Put the samples in clean containers (glass bottles or jars), label samples as to where the water was obtained, and set up an interest center.

3. Dramatize various ways man uses water: brushing teeth, washing hair, watering pets, etc.

4. Name different forms water is in when it comes to the earth (snow, sleet, hail, rain, etc.). If possible, collect some of the forms. If you can collect any solid forms let them melt so children can see them change to liquid water. The teacher can also show the three forms of water by melting ice (solid), taking the water (liquid) and heating the water to steam (gas). Hold a plate over the boiling water so children can see the steam forming droplets on the plate.

Content: Man needs water or liquids containing water.

Materials: A supply of packages of pre-sweetened Kool-Aid adequate to prepare a cup per child, paper or plastic cups, water, one pitcher per every 7 or 8 children.

Learning Experience

Note: For 15 to 30 minutes before this lesson begins, do not grant permission to get a drink except in the case of an emergency.

Divide class into groups of approximately 7 or 8. Provide each group with Kool-Aid and a pitcher. Ask the groups how they will find out how to make the Kool-Aid. Point out the importance of directions in preparing something and the need for reading in order to determine the directions for preparing Kool-Aid. Read directions to the class and let groups make Kool-Aid. After Kool-Aid has been made, set the pitchers within sight of the children and tell them they cannot drink it and that for a while they cannot go to the water fountain to get drinks. (This will most likely make many students thirsty within minutes.) For a few minutes talk about times when they recall a drink of water being really refreshing; e.g., after a long walk, after playing ball, etc. Ask class what would happen if they could not have any water or anything else to drink for a week. Some will probably say they might die. Then ask class how they could find out how long man can live without water.

Ask, "How many of you would like to go get a drink? Are you really thirsty? If you're thirsty, can you tell us how you feel?" How would you feel if you couldn't have any water all day? After children have expressed their thirstiness and their feelings when thirsty, let children pour cups of Kool-Aid. As they are drinking it, ask how it tastes. "Does it feel good to have something to drink now? Do you now feel any different from when you were thirsty? How?"

Refer back to earlier pupil ideas concerning how they could find out how long man can live without water. Let individuals or small groups explore proposed sources of information until they collect the appropriate data.

Behavioral Objectives	Focusing Questions
Children will:	
Follow directions in making Kool-Aid.	How can we find out how to make the Kool-Aid correctly?
State times when a drink has really been appreciated.	Can you tell about a time when you were really happy to be able to have a drink?
Suggest sources of information.	How could we find out how long a person can live without water?
Describe how they feel when they are thirsty.	How do you feel when you're really thirsty?
Compare feelings when thirsty and when not thirsty.	Do you now feel any different from when you were thirsty? Describe how you feel different.
Locate data on how long man can live without water.	Now let's use some of the ways you suggested earlier to find out how long man can live without water.

Supplementary Learning Experiences

1. Make a display of labeled child-drawn pictures or magazine cutouts of various liquids drunk by man.

2. Let children experiment with Kool-Aid by mixing different flavors and trying them for variations in taste.

3. If you were trying to get people to buy soft drinks, how would you advertise -- by TV, radio, newspaper, billboards, etc? Work in groups to plan a presentation.

Content: Many of the foods we eat contain water. Some foods have more water content than others.

Materials: Two oranges, two tomatoes, two potatoes (try to get oranges, tomatoes, and potatoes of approximately the same size), three plastic containers, three clear water glasses, strainer, masher, cutting knife.

Learning Experience

Conduct this activity as a demonstration. First have children name the three food items. Then put one of each item in a plastic container (cut the items into small pieces as you put them in the container).

Use a potato masher or some other handy kitchen utensil to mash the foods well. Mash until most of the water has been separated from the pulp. Then strain the liquid (water) from the pulp for each item into the water glasses. Ask students what they think the liquid is that came from the items. If they have difficulty, explain that it is water with some coloring from the food item.

Next to the liquid and pulp of each food, place the other example (the unmashed) of each item. Let students compare the amounts of liquid that come from the various foods. Then have them compare the amount of liquid derived from each food with the total size of the unmashed food item.

Put a listing of common foods on the board. Ask whether they think each food has much or little liquid in it. Suggest that with the help of their parents they test one of the food items at home and report back to class the next day.

Example of the chart:

Food	Amount of Liquid
1. Apple	Some
2. Bread	Little
3. Breakfast cereal	None

Summarize by asking if all foods have liquid in them. For foods which do contain liquid, do they all have the same amount of liquid?

Behavioral Objectives	Focusing Questions
Children will:	
Name the three food items.	What are the names of these foods?
Observe as the demonstration is conducted.	Watch carefully as I mash these three foods. Be looking to find out what happens to the foods.
Compare the amount of liquid in each food to the total amount or size of the food before mashing.	Look at the size of the tomato. Now look at the part of the mashed tomato that was water. Was there little or much water in the tomato? (Repeat for the orange and potato.)
Compare the amounts of liquid obtained from the food items.	Which food contained the most water? The least? How can you tell?
Name other foods that they think contain water.	What are some other foods that you think might contain water?
Test the amount of liquid in a food (with the help of parents).	How much liquid did the food you tested have in it?
Draw conclusions that many foods contain water and some foods contain more water than others.	Do all foods have water in them? Do the foods that have water in them all contain the same amount of water?

Supplementary Learning Experience

1. Conduct the demonstration/experiment with some food items unfamiliar to the class.

Content: Water is the source of some of man's food.
Materials: Tuna fish can, several other containers of fish products, map of the United States, circles made of colored construction paper.

Learning Experience

Prior to the beginning of the lesson, put a map of the U. S. on a bulletin board. Ask children to recall the "Charlie the Tuna" television commercials. Volunteers can summarize the point of the commercials for the class. Ask, "Where does Charlie Tuna live? What happens to the 'good' tunas?" If class wishes, volunteers might wish to act out a "Charlie the Tuna" commercial.

Find out how many children have eaten tuna. Then determine what other fish they have eaten. Make a listing on the board of the fish they've eaten. Show students a tuna fish can. Ask, "Could we tell from the can where the tuna was put in the can?" If no one knows, read the part of the label that gives the point of processing. Find that city or approximate area on the map and tack a large colored circle made of construction paper on the location. Then ask, "How could we find out where the other kinds of fish we eat are packaged or canned?"

Ask students to bring cans or packages that fish and fish products come in to class the next day. Explain that if the fish is still in the can they will be able to take it back home. The next day have children tell the kind of fish that was in the package or can and put circles on the map for the locations given on the containers. (The teacher may wish to bring a variety of containers in case the class cannot provide many.) Once the circles are all on the map have students look at the pattern of the circles. Discuss this pattern (along the ocean and/or large water bodies). With the class devise an appropriate title for the display (see Diagram 1 on page 9 for illustration). The teacher may wish to make a transparency from the map in Diagram 1 and then use that map on the overhead projector to make a large U. S. map outline that can be traced on the bulletin board.

Note: The teacher may wish to provide each child with a desk copy of a map of the United States. Then each child can locate the places on his individual map as the large map is being developed by the class.

Behavioral Objectives	Focusing Questions
Children will:	
Recall and summarize television commercials.	How many of you have seen "Charlie the Tuna" on television? What are those commercials about? What happens to the "good" tunas?
Name types of fish they and their family eat.	Have you eaten tuna? What other types of fish have you eaten? (List as many varieties as they can think of.)
Collect containers for fish and fish products.	What kinds of containers do fish come in at the grocery store? Check at home and see if you can find a container that fish was in that you could bring to class.
Find names of processing sites on food labels.	Find the place on the can that tells where the fish came from.
Discuss a map pattern.	Where are the circles on the map? What do they tell you about fish and where they're packaged?

Diagram 1
A SAMPLE MAP OF FISH PROCESSING SITES*

LEGEND

Site of Processing of fish

*Based on the fish products found in one housewife's pantry.

Supplementary Learning Experiences

1. Read the book, Harvesting the Sea, by D. X. Fenton (J. B. Lippincott Company, Philadelphia, 1970). This story is about what man is now harvesting from the sea and what he eventually hopes to accomplish.

2. Read Questions and Answers About Seashore Life by Ilka Katherine List (Four Winds Press, Englewood Cliffs, New Jersey, 1970). This is a simple science book about seashore creatures such as clams, crabs, jellyfish, etc. List animals mentioned in the story and then find out which are used by man for food.

3. Visit a local fish market (or grocery store) to see different kinds of fish people use for food.

4. Find out what kinds of fish there are in fresh water (streams and lakes around Athens) and in salt water.

Content: Plants need water.
Materials: Mung beans, loam soil, half pint milk cartons from cafeteria, water.

Learning Experience

Pass out a milk carton to each child. Fill the cartons approximately two-thirds full with loam soil. Plant three to five mung bean seeds in each carton. Plant seeds about ¼" deep. Water the soil in each carton lightly. After the bean seeds have sprouted and the plants have grown about three or four inches, divide the cartons into three groups. One group is to be watered very lightly (just enough to barely wet the surface only) every other day. Another group is to be watered well every day (enough water to soak well into the soil). The third group of cartons is to receive no water. Label groups on a display table.

Review the standards for judging the healthiness of plants that were developed in the man-land module. Observe the growth of the plants for several days. Have children make statements about what is happening to the plants and why. Judge the healthiness of the plants. Ask questions to focus children on the cause of the differences in healthiness.

Note: The teacher may wish to germinate the seeds before the planting. If enough healthy plants are left from activities of the first module (1A), "Support for Man's Activities: A Look at the Land," it may not be necessary to do any more planting. At least nine cartons of plants will be needed if the teacher does not have each child plant a carton of seeds.

Behavioral Objectives	Focusing Questions
Children will:	
Recall standards for judging the "healthiness" of plants.	How can we tell which plants are the healthiest?
Observe the growth of the plants.	What is happening to the bean plants? How can you tell?
Describe how the plants have changed.	How are the plants different from when we divided them into the three groups?
Use derived standards to judge the healthiness of the plants.	Which plants are healthiest? How do you know?
Explain the cause for the differences in the healthiness of the plants.	What caused the differences in the plants? What does this tell you about the importance of water to the growth of plants?

Supplementary Learning Experiences

1. Have children check with their mothers to find out the names of plants found in their homes. Find out how often the plants are watered and how much water is given various plants. From this information make a listing of common house plants with comments concerning whether the various plants need little or much water.

2. Think of times when plants may not get enought water to grow well; e.g., during times of drought, when away on vacation, when we forget to water them, when there is a low supply of water in the community, etc.

3. Ask, "Is it possible to give plants too much water?" Have class propose an experiment to determine an answer to the question. Conduct the experiment.

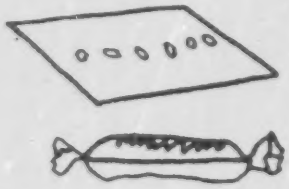
Content: While plants do need water in order to live, they can be grown without soil.

Materials: Dependent upon the situation chosen for developing a hydroponic garden (see the several situations described in the learning experience below).

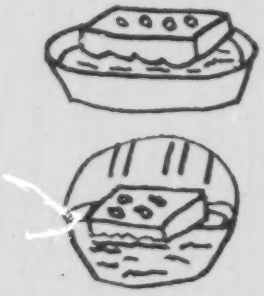
Learning Experience

After completing the module on man and the land, children may think that soil is necessary for growing plants. The soil is not essential; it is the nutrients found in some soils that are needed. To show that plants can grow without soil, the class will develop and observe a hydroponic garden. Select one of the methods described below for growing plants without soil. Gather class around a table where all can see what is being done and construct a hydroponic garden. Below are some suggestions which will allow for many creative variations in gardening without soil.

1. Obtain a strip of gauze or sheeting about 6 x 8 inches. Place seeds upon the strip about one inch apart. Cover the strip with a water-dampened strip. Carefully role the strips and fasten them at the ends with rubber bands. Set the rolled strips in a shallow dish of water. Unroll them every few days to observe.

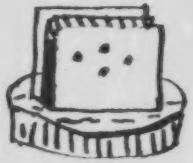


2. Set a wet sponge in a saucer of water and sprinkle some seeds such as grass seed, bird seed, or any individual seeds upon it. If the sponge is set in a deep bowl, the bowl can be covered with plastic sheeting to create a greenhouse effect. A porous brick or wad of cotton can be used in place of the sponge.



3. Set a block of wood across a pan of water. Fold a blotter so that it rests across the block like a saddle and so the ends dip into the water in the pan. Place seeds upon the blotter. A greenhouse effect may be obtained by inverting a glass jar over the seeds.

4. Place a blotter or layer of cotton upon a sheet of glass such as a lantern slide glass (3 x 5 inches works well). Set seeds upon the blotter about two inches up from a long side base. Place another sheet of glass on top and fasten the pieces together with several rubber bands. If the selected seeds are large, small strips of wood along the edges will keep the pieces of glass separated. Stand the apparatus in a pan or tray of water to keep the center moist.



5. Role a blotter, paper toweling, or cloth and slip it inside a jar or other glass container. Fill the center of the container with peat moss, cotton, excelsior, sawdust, sand or some similar material. (Note: Some materials, such as sawdust, tend to discolor the water and blotter.) Place seeds between the glass and the blotter. Space the seeds evenly and about a quarter of the way down the side. Moisten the material in the center of the glass. A little water may be kept in the bottom of the glass but do not let the water touch the seeds directly. Occasionally, it may be necessary to replace the water that is lost by evaporation.

6. Tie a piece of cloth over the mouth of a small jar. Set the jar in a larger jar or pan and let the extra cloth length hang down the sides into an inch or two of water. A sheet of glass may be placed across the large jar to keep the inside air moist. Scatter seeds onto the part of the cloth that covers the mouth of the small jar.

Hydroponic or chemical solutions may be prepared by dissolving in one quart of distilled water each of the following: 1/64 ounce calcium sulphate; 1/64 ounce monocalcium phosphate, 1/64 ounce magnesium sulphate; 1/32 ounce potassium nitrate; one drop of diluted iron chloride. Similarly, liquid fertilizers can be added to tap water according to the directions given on labels. Commercially prepared hydroponic solutions can also be obtained from local nurserymen or scientific supply houses.

To prepare a larger hydroponic garden, obtain a large shallow container that will hold water. Place over the top of the container a wire screen that will support a bed of moist sand, gravel, cinders, peat moss or sawdust. Plant seeds in the bed. As they germinate, their roots will reach into the solution below. A fish tank aerator can be added to the container to mix and aerate the solution occasionally or as needed. For individual use and study, small jars may be prepared in a similar way.[1]

Note: If the teacher cannot obtain the materials for the hydroponic solution a small amount of liquid fertilizer can be added to the water. The plants will also grow using water with nothing added.

[1]Directions for this activity were taken from "Soilless Gardening," by Lawrence Lowery and Rita Peterson, Science and Children, September, 1968, pp. 18-19.

Behavioral Objectives	Focusing Questions
Children will:	
Name materials used to construct the garden.	What materials did we use to make our garden?
Describe growth of the plants.	What can you say about the growth of the plants?
Evaluate "healthiness" of the plants.	Would you call them "healthy" plants? Explain.
Compare gardening with soil with gardening without soil.	How is this garden different from the gardens we planted in the milk containers (from the man-land module)?

Supplementary Learning Experiences

1. Allow groups of children or individual children to independently construct one of the six smaller hydroponic gardens described in the learning activity.

2. Have children take a slip from some plants such as honeysuckle, ivy, or philodendron, and observe them taking root in water.

3. Leave a potato out in a damp part of the room and watch the "eyes" sprout. Cut out the "eyes" and plant them.

Content: We use water to clean things. We often add cleansing elements to the water.
Materials: Water, soap.

Learning Experience

Begin with a demonstration of washing your hands with soap. Let children talk about why they wash their hands. Then ask:

1. How else do we keep our bodies clean?
2. What other things besides soap can we add to water to clean ourselves?
3. What other things besides ourselves do we wash?
4. What can you add to the water to clean (Responses to Question 3)?

Tell the children that they're going to play a game. In the game a person is to act out how he might use water to clean something. The class will try to (1) guess what he is cleaning and (2) tell what could have been added to the water to help in the cleaning. Demonstrate again the washing of hands (without soap and water) to show how the "acting out" is done without props. Give students a little time to think about what they will "act out." Then children take turns presenting their ideas. Class members tell what is being cleaned and what may have been added to the water. Conclude by constructing a sentence chart on the chalkboard (see Diagram 2). Fill in a sample sentence. Then let children make their own sentences using what was done in the "acting out" activity. After the dramatizations and sentence building activity, help children draw conclusions concerning the importance of water in the cleaning process.

Behavioral Objectives	Focusing Questions
Children will:	
Cite ways they keep their bodies clean.	What different things can we do to keep our bodies clean?
Recall from experience different cleansing agents they have added to water.	What can you add to water to help clean things?

Behavioral Objectives	Focusing Questions
Name and classify other items that they or their family often clean.	What things other than yourself do you or other members of your family clean? (Classify them.)
Act out the cleaning of some item.	How will you act out how you use water to clean the item you have chosen?
Interpret dramatizations.	What was _____cleaning? What could have been added to the water?
Make sentences using knowledge gained from dramatizations.	Can you make a sentence like the one on the board (see Diagram 2) that will describe what you "acted out?"
Make concluding statements.	While we may have added different kinds of soaps, shampoos, etc., what was used each time we washed something?

Supplementary Learning Experiences

1. Make a display of empty containers of cleansing agents.

2. Collect magazine and newspaper pictures that advertise any product for cleaning. They could classify pictures; e.g., personal cleaning, household cleaning, etc.

3. Ask children to watch TV for shows that advertise cleaning; e.g., Mr. Clean, Lemon Pledge, etc. Have them dramatize some and let the class guess what they are acting out.

Diagram 2

Sentence Chart

	_____		_____.	
	_____		_____.	
	shampoo		hair	.
We use water and	soap	to wash	our hands	.
	Tide		clothes	.
	_____		_____.	

Content: Water cleans the air.
Materials: Large sheet of white construction paper.

Learning Experience

Place a large sheet of construction paper on a flat surface above the ground. (Attach it to the surface.) Tell the class that after a rain they will bring the paper back inside, let it dry, and then examine it. Find out how they think the paper will be different.

After a rain bring the paper inside and dry it. Then examine the paper. After a few general responses, focus discussion on dirt particles or discoloration caused by dirt. Ask, "Where did the dirt come from? How did the dirt get on the paper. Of what value was the rain in getting the dirt out of the air?" Conclude by asking for other examples of things that water in the form of rain can clean.

Note: The teacher may find it helpful to put the paper out at the beginning of this module in order to allow several days for a rain. After a rain, the dried paper can then be used at any time.

Behavioral Objectives	Focusing Questions
Children will:	
Hypothesize about how the paper will be different following a rain.	How might the rain change the paper?
Examine the paper following a rain.	What can you say about the sheet of paper? How is it different from when we put it outside?
State reasons for changes in the paper.	What caused the brownish circles on the paper? (Ask similar questions for other changes.)
State other examples of the cleaning power of falling rain.	What other things can be cleaned by falling rain? Name as many as possible.

Supplementary Learning Experiences

1. Following a rain go on an excursion around the schoolgrounds to locate other signs or evidence that dirt might have been in the air when it rained.

2. Have children ask their fathers if they've ever washed their car just before a rain. What did the car look like after the rain? Was there dirt on the car after the rain?

3. Read the poem, "Please to Have a Little Rain," by Aileen Fisher (In the Woods, In the Meadow, In the Sky, Charles Scribners Sons, New York, 1965, page 57).

Please to Have a Little Rain

Please to have a little rain,

Mrs. Sky.

Lawns and gardens wait in vain,

grass is dry.

Robins must have mud, you know,

for a nest.

Plants need watering to grow,

rain is best.

Bushes standing in a huddle

need a drink.

And my boat should have a puddle,

don't you think?

Content: Man can use water as an intermediate support for movement or transportation.
Materials: Story (provided), large map of Georgia.

Learning Experience

Ask children if they know what an "island" is. If not, show examples of islands on a large wall map and the globe. Ask questions until they understand that an island is a body of land completely surrounded by water. Then prepare class for listening to a short story. Tell them they are going to hear a story about a trip to an island. Read the story, "A Trip to the Island." Following the story ask the class to summarize what happened in the story. Then ask, "Did anything silly happen in the story? Could the story really have happened like that?"

On a large map of Georgia point out Jekyll Island and the coast across from it. Find Brunswick, Georgia, on the map. Ask why a car could not make the trip across the top of the water. What would be needed for the car to get from the coast to the island? What other means of transportation could be used to get from the one place to the other? Make a list on the chalkboard of the methods children propose.

Make up a situation where a boy or girl must get from one point to another separated by water. On a piece of art paper each child is then to draw a picture of how he would travel.

Behavioral Objectives	Focusing Questions
Children will:	
Summarize what happened in the story.	What happened in the story?
Detect the illogical statement in the story.	Did the story tell about anything that could not happen? Was any part of the story silly?
State ways that a car could get from one point to another across water.	How could the car get across to the island without going into or through water?

Behavioral Objectives	Focusing Questions
Name means of transportation used for moving across water.	How can people move through or across water?
Draw a picture depicting the means of transportation they would select for getting across a body of water.	How would you get to _____? Draw a picture of how you would do it.

A Trip to the Island

Saturday morning had come at last! Jerry and his sister, Carole, hurried to the window to see what kind of day it was. It was even more beautiful than they had hoped. The sky was deep blue with great fluffy white clouds and the sun was warm and bright. They would surely go on their picnic now. They could hardly wait to get started!

Mr. and Mrs. Adams were also happy to see such a beautiful day. They had planned this picnic on Jekyll Island for a long time. Everyone was going to have such a lovely time.

All the family helped pack the car with the delicious picnic lunches and, finally, they were on their way. There was not much traffic on the road and the three-hour drive to Brunswick was a pleasant one for all. What a beautiful sight it was right at the ocean's edge with the great waves splashing on the beach. Even from here, Jerry and Carole could already see the outline of Jekyll Island where they would spend the rest of the day. They could hardly wait to get there! Mr. Adams called to them to get back in the car and fasten their safety belts. They were headed for Jekyll Island.

Supplementary Learning Experiences

1. Find pictures of various types of water transportation. Compare and contrast the pictures obtained.

2. Let children describe personal experiences they've had traveling on water.

3. Ask children to bring in models of boats they may have for a display.

4. Explain what is meant by a hydrofoil as a different way of traveling on water. Have children find pictures of a hydrofoil.

Content: People use water for recreation.
Materials: One Morning in Maine by Robert McCloskey (Viking Press, New York, 1952), drawing paper, crayons, pictures showing people using water for recreation.

Learning Experience

First, prepare children for the reading of a story. Then read the book One Morning in Maine by Robert McCloskey (The Viking Press, New York, 1952). Following the reading, let children talk about what they liked about the story. Then focus discussion on how the main character of the story had fun with the water. Ask, "Have any of you ever used water in order to have fun?" As children name ways they've used water for fun, write their ideas on the chalkboard.

Then show a variety of pictures depicting people using water for fun. If the idea of the picture is on the board, have children match the picture with the idea. If the idea is not already written on the board, add it to the list. After children have named all the things they can think of and considered all the pictures, focus attention on the list on the chalkboard. Ask, "What does this list tell us about how we use water?"

Conclude the lesson by having each child draw a picture of himself using water to have fun. (Leave the list on the board for reference during the drawing activity.) Make a bulletin board display of their pictures. Title the display "Water for Recreation." If children do not know the meaning of the word "recreation," explain it in terms of "having fun."

Behavioral Objectives	Focusing Questions
Children will:	
Listen as a literature selection is read.	Listen carefully to find out how water is used for fun in this story.
Recall ways the main character of the story had fun with water.	How did _____ have fun with water?

Behavioral Objectives	Focusing Questions
Name ways they've used water for recreational purposes.	How have you used water in order to have fun? Name as many as possible.
Match ideas represented in pictures with ideas written as words or phrases.	What does this picture show? Is that idea already in the list on the board?
Make summarizing statements.	What does the list tell us about how we use water?
Draw pictures of themselves having fun with water.	How many different fun uses of water were drawn?

Supplementary Learning Experiences

1. Sing the song, "What Shall We Do on a Rainy Day," (in Singing with Children by Aubin and Dyme, Wadsworth Publishing Company, Belmont, California, 1962, p. 38). Talk about how water in the form of rain, snow, etc. can both (a) provide unique means of recreation (sledding, skiing, etc.) and (b) prevent outdoor recreation due to weather conditions.

2. Make a class list of some safety rules to be followed when having fun in the water. If children wish they might illustrate some of the rules they name.

Content: Water has the power to break big pieces of rock or soil into smaller pieces. This breaking down is one process by which soil is made.

Materials: Pieces of clay, milk cartons, water, pencils or popsicle sticks.

Learning Experience

Give each child a milk container with a fairly hard piece of clay in it. After observing and feeling the clay, have children verbally describe it. Ask if it looks like a hard piece of dirt or soil. "Do you think water will be strong enough to make this hard piece break into small pieces?" Tell the class that they are to watch and feel the clay to see how it changes after the water is poured on it. Pour enough water on each piece of clay to begin breaking it up or softening it. After children describe changes, have then take pencils or popsicle sticks and see if their clay will break into small bits.

Conclude by asking, "Would seeds have grown in the piece of clay when it was hard?" "Would seeds grow in the clay after the water broke it into smaller pieces?" "How could we set up an experiment to find out?" If the interest of the children warrants, conduct an experiment to answer these questions.

Note: If hard pieces of clay cannot be readily obtained from the environment, this learning experience can be conducted with hardened pieces of clay used in making pottery (available at many arts and crafts or pottery shops).

Behavioral Objectives	Focusing Questions
Children will:	
Describe a hard piece of clay.	What can you say about your piece of clay? What words would you use to describe it.
Compare clay before water was added with clay after water was added.	What has happened to the clay? How is it different now from when it was hard?

Behavioral Objectives	Focusing Questions
Decide which state of the clay would best support the growth of plants.	Would seeds have grown in the hard piece of clay? Will they grow in the clay now that the water has broken it down?
Propose an experiment.	How could we find out? What could we do?

Supplementary Learning Experiences

1. Mark off some observation areas outside the classroom. Study and describe the observation areas. Following a heavy rain, study and describe the areas again. What were the effects of the rain?

2. Measure the amount of sediment in a jar of water taken from a stream or river immediately after a rainstorm. Measure the amount of sediment in a jar of water from the same stream a week after the rainstorm (or any other rainstorm). Allow water to stand at least 24 hours before measuring and comparing the amounts of sediment found in the two jars.

3. Show children pictures of places such as Grand Canyon, Carlsbad Caverns, etc. and explain how over years water has worn away rock leaving the beautiful formations we now see.

Content: Man can build an environment in an aquarium.
Materials: Aquarium, sand, plants, guppies, filter, aerator, heater, food for fish.

Learning Experience

This learning experience is essentially the development of an aquarium environment and a simple discussion of the process. Begin by explaining that the class is going to make a "home for fish" and that this home is called an aquarium. Make a large label for the word to be placed on or near the completed aquarium.

As each step of the aquarium construction is completed, summarize the step by putting a picture of the step and a simple sentence describing what was done on a large sheet of paper. When everything is completed, the sheets can be put together into a booklet. Some children may wish to use this as a guide as each child then makes his own booklet describing how an aquarium is made. Completed booklets can then be taken home. Encourage children to develop aquaria at home with the help of their parents. If some children already have an aquarium at home, suggest that they ask their parents questions about how they "made" the aquarium. If any children set up an aquarium at home, have them report back to the class.

Setting Up the Aquarium

1. Clean the inside of the aquarium thoroughly.
2. Place approximately two inches of sand in the bottom of the aquarium. Usually the sand is sloped slightly so that it is higher in the back of the aquarium.
3. Add tap water to the aquarium until the water level is about one inch from the top. Let the water "age" for 12-24 hours before adding fish.

1. Why do you suppose we must clean the inside of the aquarium?
2. Why do we put more water than sand in the aquarium?
3. Why do you think we let the water "age" before adding the fish?

4. Plants may be placed in the sand during the time the water is aging. Anacharis is one of the most common but the pet shop will have several varieties of plants from which you may select.	4. In what ways might plants help life in the aquarium?
5. Guppies are one of the easiest fish to propagate in the aquarium. When the fish are to be placed in the aquarium, allow the bag in which they have been placed to rest in the aquarium water for several hours. In this way, the water in the traveling container will adjust to the same temperature as the aquarium water and there will be less of a shock to the guppies when they are released into the aquarium.	5. Why did we have the guppies stay in the bag for a while before we let them out of the bag and into the aquarium?
6. Snails may be added at the time of adding guppies.	6. Does anyone know how snails help the aquarium home? What do they do?
7. For ease of maintenance, it is suggested that a filter and aerator be used in the aquarium. This will keep the water clear and will also allow for a greater number of fish to live in the tank.	7. What are the purposes of the filter and aerator? If you don't know, how could we find out?
8. Although guppies are reasonably tolerant of water temperature changes, most people use a heater in the aquarium. Inexpensive ones with a built-in thermostat are readily obtainable.	8. What might happen if we did not put a heater in our aquarium?
9. A local pet shop will have fish food with the feeding directions for your fish.	9. Why do we have to add food for the fish? Why couldn't we just put any kind of food in the aquarium?

Behavioral Objectives	Focusing Questions
Children will:	
As a group (with the teacher), construct an aquarium.	What do you think we will need to do to make this "home for fish" called an aquarium?
Analyze the purposes of various steps in the construction of an aquarium.	As different steps of construction are being undertaken, ask questions to get at the purpose of the steps. Sample questions for the steps are provided on the previous page with the various steps for the construction of an aquarium.
Make booklets describing the steps in making an aquarium.	Now we are going to make individual booklets which you can take home. What will you want to say about how an aquarium is set up? What pictures will you want to draw to show how we made our aquarium?

Supplementary Learning Experiences

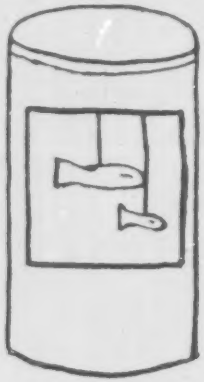
1. Let children propose and conduct simple experiments to learn about the behavior of the fish in the aquarium. For example, what do they do when you make noises on the glass near them, what happens when you try to carefully touch them with a stick, etc.

2. Make a bulletin board aquarium. Cover bulletin board with blue or blue-green construction paper. Children then cut out fish, water plants, etc. from colored construction paper and position them on the board. Colored chalk can be used to draw items on the background paper and to add detail to the fish and plants.

3. Read Carol Carrick's The Pond (Macmillan, New York, 1970), an examination of the life of a pond and the animals dependent on it for food and shelter.

Supplementary Learning Experiences

4. Make fish bowls out of oatmeal boxes (or any large round cardboard boxes). Cut a window on the side of the oatmeal box, tape a piece of cellophane over the window on the inside of the box. Children cut out and color fish and attach them by string to the bottom of the box top lid (at approximate level of the window). As the lid is turned the fish will appear to be swimming as you look through the window. Decorate the boxes.



Content: Life would be impossible without water. Water shortages would make life difficult.

Materials: Experience chart, art materials (dependent upon medium selected by children).

Learning Experience

Each child should be given a large sheet of newsprint or construction paper. Give children a choice of a pencil or charcoal, crayon, paint, or cut paper for the art medium. (Let each child choose the materials he wishes to use.) After materials have been allocated, ask, "What would it be like if there were no water or if tomorrow we started running out of water?" The children may need help in seeing the consequences for all phases of life. If so, add cues to questions. Each child then makes a picture of what he thinks life would be like under the given circumstances.

As children finish pictures, individually ask each child to make a sentence or statement about his picture. With magic marker put his words either on the picture or on a strip of paper that can be taped to the picture. When all are finished, bring out an experience chart entitled, "Life Without Water." Students use the ideas from their sentences to make a short story. Read the story back to the class. Let individual children volunteer to read parts of the story to the class. Conclude by asking the class if they would rather live in a place that had little water or a place that had much water. Have children explain their responses.

Behavioral Objectives	Focusing Questions
Children will:	
Make a picture depicting life without water.	What would it be like if there were no water? What could it be like if we started running out of water tomorrow?
Make descriptive statements or sentences about their pictures.	What is your picture about? What do you want to say to tell others about your picture?

Behavioral Objectives	Focusing Questions
Collectively make an experience story describing life without water.	Now we are going to use our pictures and words to make a story named "Life Without Water." What would you like to say in this story?
Read parts of the story to the rest of the class.	Would someone like to read the story or a part of the story to the class?
Make choices concerning where they would like to live.	Would you rather live in a place that had a little water or a place that had much water? Why?

Supplementary Learning Experiences

1. Read the book, Water at Work, by J. S. Meyer (World Publishing Company, Cleveland, Ohio, 1963), an account of the relationship of water and life and the proper usage of water in the home, business, industry, and agriculture.

2. Show some pictures the astronauts took of the moon. Explain that although we have given places on the moon such names as the Sea of Tranquility, there is no water on the moon.

Level Two: Seven Year Olds
Theme B: Man and the Water

INSTRUCTIONAL MODULE 2B

WATER POLLUTION

MODULE GENERALIZATION: Man and his activities are responsible for polluting his water resources.

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1973

Preface

The purpose of the Primary Environmental Education Project of the University of Georgia was to develop and field test nine instructional modules designed as supplementary material for a primary level social studies program. The modules focus on teaching/learning activities that will build an understanding of the interrelationships between man and the land, water, and air. In the construction of the modules primary emphasis was given to the thinking processes of young children and the provision for many opportunities to engage in creative thinking.

Project personnel are: Everett T. Keach, Jr., and Elmer D. Williams, Co-Directors; Cheryle Johnson and Ann McCarthy, Research Associates; Marie Banks, Faye Jenkins, Carole May, and Vickie Spence, Clarke County Public Schools, Project Associates; Agnes Amos, Dycie Campbell, Judy Carter, Aurelia Fraley, Evelyn Griffin, Thelma Hurley, Margaret James, Dorothy Keach, Faye McKinney, Virginia Rogers, and Marty Shirley, Project Teachers, Clarke County Public Schools; Elizabeth Acheson, Frank Golley, E. Paul Torrance, and William Zeitler, University of Georgia, Project Consultants.

Materials were developed under a contract with the Office of Environmental Education, U. S. Department of Health, Education and Welfare. Contractors undertaking projects under such government sponsorships are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, represent official Office of Education position or policy.

Cover design by Sherri Hardeman, a primary level pupil at Oconee Street Elementary School, Athens, Georgia.

REQUIRED MATERIALS

Throughout this module a variety of materials and/or arrangements will be required. Since some of these may take time to secure, we are providing you with a list of materials in the order in which they will be needed.

1. Experience chart paper, crayon

2. Three large jars of water, bits of aluminum, cotton, bread

3. Three large jars of water, oil, bits of pollutants (paper, glass, pop tops, wood, etc.)

4. Two medium size jars, funnel, cotton, sand

5. Three detergent boxes, experience chart paper, construction paper squares

6. One milk carton per student, enough loam (mixture of 1/3 clay, 1/3 humus, and 1/3 sand) to fill each milk carton, one cup detergent water - various kinds, teacher will have to plant beans prior to the lesson.

7. Eighteenth Century Flute Derets, "Beethoven's Allegro Minuet in G Major (1972)" Washington Records, WR 442, 1340 Connecticut Ave., Washington 6, D. C. - for clean water. Cluytens, Andre, The Paris Conservatoire Orchestra, Debussy, "Jeaux," Angel Records, 36212 - for polluted water

8. Guest speaker from Southeastern Environmental Protection Agency (546-3127) experience chart paper

9. One large jar of water, oil, 3M Brand Sorbant

10. Commercial jingles, simple songs

Level Two: Seven Year Olds
Theme B: Man and Water
MODULE GENERALIZATION: Man and his activities are responsible for polluting his water resources.

Content: Water is essential to all living things.
Materials: Experience chart, paper, and crayon.

Learning Experience

Have the children brainstorm in small groups of three or four about the different ways they use water. After a few minutes ask them to share with the class and list their responses in the form of an experience chart. Take only a few at a time from each group so that everyone will have an opportunity to contribute. Then focus them on the ways other living things use water. After they have considered many uses, have them think about what life would be like without water. They might think about what differences a lack of water would make on that day; e.g., couldn't brush teeth, no coffee for breakfast, etc.

Behavioral Objectives	Focusing Questions
Children will:	
State the various ways they use water in their daily lives.	What are some of the ways you use water at school and at home? (drinking, cleaning, cooking, swimming, etc.)
State various ways other living things use water.	How do other living things use water? (plants, animals)
Predict what life would be like without water.	Suppose our city ran out of water. What might have been different today?

Supplementary Learning Experiences

1. Take a small plant and refrain from watering it. Observe the changes in the plant.

2. Take the children outside to play. When they come back in, don't allow them to have any water. Discuss their reactions.

3. Have a nurse or physician come in to speak to the children about how human bodies absorb, store, and eliminate water.

4. Discuss the necessity of water to industry.

5. Write an experience story around the topic "The Year We Began to Run Out of Water."

6. Keep a record of all the different uses of water in your home during one week. Compare your record with the records of some classmates.

Content: Water can purify itself through settling.
Materials: Three jars of water, bits of aluminum, small leaves, stones, twigs, experience chart paper.

Learning Experience

Present to the class a jar of water containing aluminum and stones. Shake up jar and have children make observations about the settling of the materials in the jar. Record on an experience chart the time it took for the materials to settle and the observations made. Discuss what they observed. Take a second jar of water containing bits of leaves and twigs and shake up this jar. Again record observations and the time for settling to take place. With a third jar add the same amount of aluminum, stones, twigs and leaves and repeat the same process. Have the children discuss the differing settling times. Lead them to conclude that some items settle more quickly than others and that water has the ability to purify itself through settling some items more easily than others. Have the children pretend they are fish and choose which jar they would prefer to swim in. Have them give reasons for their choices. Conclude the discussion by eliciting their feelings about depositing wastes in our rivers.

Behavioral Objectives	Focusing Questions
Children will:	
Observe the settling of materials in each jar.	What do you see in this jar? What happened to the materials in the jar after we shook the jar up? (Do this for each phase of the experiment.)
Give reasons for the settling rate of materials.	Why do you think the materials in the one jar took longer to settle than the materials in the other jar?

Behavioral Objectives	Focusing Questions
Draw conclusions from their observations about depositing waste in our rivers.	Let's imagine that each of these jars of water is a river. From your observations, what does this tell you about depositing wastes in our rivers?
Pretending to be fish, state which jar of water they would most like to swim in - least.	Let's pretend we're fish. Looking at the three jars, which water would you most like to swim in? Why? Which water would you like to swim in least?
Give reasons for these statements.	Why would you rather swim in that one?
Draw conclusions about depositing wastes in our rivers.	From your comments on where you would like to swim if you were a fish -- what does this tell us about depositing waste in our rivers?

Supplementary Learning Experiences

1. Shake a glass of very dirty water and note the rate of settling. Try the same demonstration adding dirt to other liquids: Kool-Aid, fruit syrup. Compare the rate of settling.

2. Use two pieces of clean white cheese cloth as strainers. After shaking a jar of dirty water , pour some water through the cheese cloth into another container. After the water settles, pour some of the water through the other piece of cheese cloth. Compare the results.

3. Show how additives can be diluted. Make a glass of Kool-Aid but conceal the glass in a way that children will not be able to tell what's in it (or children could be blindfolded as they taste the liquid). Have a child taste it to see what flavor it is and not tell any of his classmates. Take another glass of water and add it to the remains of the glass of Kool-Aid. Have another pupil drink part of it and guess the flavor. Continue to do this until they can't tell what the flavor is. Compare the children's guesses as to the flavor of the liquid.

Supplementary Learning Experiences

4. Drop different objects into a large jar of water. Record the number of seconds it takes each object to settle to the bottom. Rearrange the names of the objects in an order of fastest settler to slowest settler.

Content: People have made harmful changes in our waterways.

Materials: Three jars of water. (1) clean water (2) water with pollutants added, including oil, food, leaves (3) water with pollutants added, including rocks, pop tops, glass.

Learning Experience

Place three jars of water on the desk as described in the materials above. Have the children describe what they see in each jar. Have them decide which jar of water they would like to drink from and give reasons for their choices. Take away the clean jar. Have the children again decide which jar they would like to drink from if they were very thirsty. Let the children role play a situation that involves one child offering another child a glass of water from one of the two polluted jars. Then have the children react to the role-playing situation.

Behavioral Objectives	Focusing Questions
Children will:	
Observe what they see in each jar.	What are we dropping into the water?
Recall observations of rivers.	Have you ever seen any of these items in a river?
Guess how pollutants get into the rivers.	How do you suppose these items get into the water.
Choose the jar from which they would prefer to drink and give reasons for their choices.	If these were the only containers of water in the world and you had to choose one of them to drink from, which one would you choose? Why would you rather drink from that jar?
Taking clean water jar away, choose which jar they would like to drink and give reasons for their choices.	Which of the two jars would you like to drink from? Why would you rather drink from that one?

Behavioral Objectives	Focusing Questions
Express attitudes toward drinking water with pollutants added.	Would you like to drink from rivers if they contained the things we added to our jars?
Role play a scene about drinking polluted water.	If you were very thirsty and someone offered you a glass of water from one of these jars, what would you say? (Pick two children from the class and have them act out the situation.)

Supplementary Learning Experiences

1. Discuss where our dishwater goes, where the water from the bathroom goes, etc.

2. Have a guest speaker from Water Works Sanitation Department come in and discuss the sewerage system of the community (especially the location of sewers) and where the water in the sewers goes.

3. Discuss where the sewers are in their community and why they may be located under the streets. Take a city map and trace in the location of sewers on the map.

Content: Water in our rivers is polluted.
Materials: Paper and pencil, two jars, funnel, sand, and cotton.

Learning Experience

Through discussion, derive some standards of what a clean unpolluted stream would look like; e.g., clear, no garbage. Take the children to the river, stream, or creek nearest the school. Take the class to a spot that has obviously been polluted with bottles, cans, paper, etc. (A prior visit to the river will determine the most appropriate location.) Have the children observe the river and list their observations on a sheet of paper for future discussion in the classroom. Be sure they include pollutants and the clearness of the water in their listing. Collect and take back to the classroom a jar full of water that contains bits of garbage found in the river. In the classroom, construct a simple filter with a common funnel. Put some cotton in the funnel and then pour on a layer of sand. Have the children list the characteristics of the river water in the jar. List them on the board. Now slowly pour some of the water through the filter into the second jar. Have the children list the characteristics of the filtered water and list them on the board. Compare the water in the two jars. Compare the two lists.

Behavioral Objectives	Focusing Questions
Children will:	
Formulate in their minds what a clean unpolluted stream looks like.	Close your eyes and make a picture in your mind of a river that contains water you would like to drink. How would a river look if it fit your picture?
Observe and list characteristics of a polluted river.	What are some of the things you notice about the river, stream, or creek?

Behavioral Objectives	Focusing Questions
Observe and list characteristics of the river water in the jar.	What things do you notice about the water in this jar?
Observe and list characteristics of the filtered water.	What things can you tell me about this filtered water?
Compare the two jars of water.	Looking at our two lists, what changes occurred in the water when it was filtered?
From the data collected, state conclusions about the cleanliness of the water in the stream and offer support for those statements.	Based on what we've just done, would you say the river was a clean river? Why do you say that?

Supplementary Learning Experiences

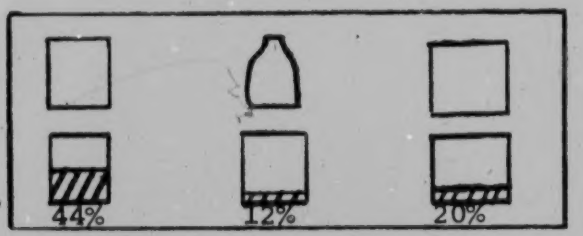
1. Draw a picture of the river that contains water you'd like to drink. Draw a picture of the real river you observed.

2. Construct two filters, one as described in the module and one with crushed chalk on top of the sand. Filter some water taken from the same sample of river water through both filters and note any differences in the water. Add two teaspoons of pond water to each jar of filtered water. Let the jars sit in the sunlight for two weeks. Discuss which jar has the greatest amount of algae growth. (The greater amount of pollution in the water, the greater the amount of algae growth.)

Content: Washing detergents contain different amounts of phosphates.
Materials: Empty detergent boxes, chart paper, squares of construction paper.

Learning Experience

Begin by showing the class three different boxes of detergents. Have the children read the ingredients that were in each package. When they find the section on percentage of phosphates, write the name of the detergent and the percentage of phosphate on the chalkboard. For each of the three boxes of detergent have a square cut out of construction paper. If a detergent contains 11% of phosphate, color in 11% of the total area of the square so as to make the square look similar to a thermometer. Explain that this detergent contains 11% phosphate and the colored area of the square shows how much of all the ingredients in the detergent are phosphates. Find and color in the percentages for the other two detergents. Have the children bring in any empty boxes of detergent they might find at home and make a bulletin board of the detergents. (If they cannot bring the box they can bring the name of the detergent and the percent of phosphates.) Mark off on the paper squares the percent phosphate for each kind of detergent and have the children color in the area. Place the squares under the correct detergent boxes. (For each detergent for which you have information but no box, make a box with the name in large, bright letters.)



From this information help the children construct a listing of the detergent brands from highest to lowest percent of phosphates.

Ask the children if they know why phosphates are added to our detergent. If they don't know, tell them it brightens and whitens their clothes. Have some of your better students locate some information about phosphates and how they get into our waterways. Have them look for data concerning the effects of phosphates as pollutants in water.

Learning Experience

You could have these students work on their reports while the rest of the class constructs the bulletin board. The reports could then be presented after the bulletin board has been completed.

Behavioral Objectives	Focusing Questions
Children will:	
Identify phosphate amounts of various detergents.	What are some of the ingredients in these detergents? How much phosphate is in each detergent?
Construct a bulletin board showing detergent boxes and the amount of phosphates in each detergent.	How much of this square should be colored to represent that percent of phosphate?
Make a list of detergents and the percentage of phosphate in each, ranking from highest to lowest.	Let's arrange these detergents in an order, starting with the one containing the largest percentage of phosphate and ending with the one that has the smallest percentage of phosphate.
Discuss the purpose of phosphates in the detergents.	Do you know why manufacturers add phosphates to our detergents? (If necessary, pupils do research to supply answers.)
Report on the purposes for and effects of phosphate in water.	How do you think phosphates get into our waterways? What effect do the phosphates have on our water and our plant life?

Supplementary Learning Experiences

1. Make a bar graph showing a comparison of amount of phosphates in each detergent.

2. Fill three jars with distilled water. Put one tablespoon of detergent in each jar. (Use detergents with varying amounts of phosphates.) Pour one ounce of pond water in each jar and let sit in the sunlight for two weeks. Compare the algae growth in each jar.

3. Develop the concept of percentage by putting a dollar bill on a desk and spreading a hundred pennies in front of the dollar. Tell the children to assume that the dollar is one whole and that each penny is a part of the whole. Together all of the pennies are equal to the whole. Take ten pennies away and tell them that they represent 10% of the whole. Continue this procedure until you have reached 100%. Extend this by the use of quarters and nickels, nickels and pennies, etc.

Content: Phosphates pollute our water and can affect the growth of plant life.
Materials: Milk carton for each student, loam, clay, humus, sand, one jar of detergent water (from different kinds of detergents).

Learning Experience

Through discussion, derive some standards for judging the "healthiness" of plants; e.g., height, color, general appearance. Teacher should pass out a milk carton to each child. Have children fill milk containers about 2/3 full with loam (combination of 1/3 humus, 1/3 clay, and 1/3 sand to be prepared prior to lesson). Direct class to plant mung bean seeds. Plant 5 seeds approximately ¼" deep in each container. Water soil lightly. Have specified children bring to class a large jar of their mother's detergent water from her washing machine. Try to include both high and low phosphate detergents (use four different brands). After beans have sprouted and are about 3" tall, divide the bean plants into five groups. Add a different detergent water to each group of plants and label the group as to the detergent and percentage phosphate added. Leave one group to be watered with regular tap water as a control. Observe the differences in growth of the plants using their criteria for healthiness.

Behavioral Objectives	Focusing Questions
Children will:	
Develop standards for judging "healthiness" of plants. (Refer to Module 1A).	What does a healthy plant look like?
Recall what was added to the different plant samples.	What were the different things we added to the plants?
Predict possible differences in "healthiness" due to the differing percentage of phosphates.	What do you think will happen to the different plants? Why?

Behavioral Objectives	Focusing Questions
Recall the standards they developed for judging the "healthiness" of plants.	How will we be able to tell if what we think will happen does happen?
(A few days later.) Apply their standards of plant "healthiness" to the different samples.	(A few days later.) What was the result of adding phosphate detergent water to the soil?
Observe possible differences in the "healthiness" of the different samples based on the various percentages of phosphates.	Which plants are the healthiest? Which plants are the least healthy?
Compare the growth of the plants watered with the different amounts of phosphates.	How does the healthiness of the plants relate to the amount of phosphates in the detergents?
Draw conclusions about the effect of water that contains phosphates on the growth of plants and support these conclusions.	Would you like to water your plants with water that contains phosphates? Why or why not? From your comments on the effect of adding phosphates to water - what can this tell us about adding phosphates to our rivers?

Supplementary Learning Experiences

1. Discuss how diseases could be spread throughout a community through the water supply.

2. Have the children tell the story of a plant living beside a polluted stream from the plant's viewpcint.

Content: Pollution decreases the quality of the environment of living things.

Materials: Two records: Beethoven's "Allegro Minuet in G Major" for clean water and Debussy's "Jeaux" for polluted water. (If the teacher prefers, one recording of music with a fairly even tempo can be used for both types of water - see "note" under the Learning Experience.)

Learning Experience

Clear a large open space in the room by pushing all chairs and desks back against the walls. Divide the class in half. One half of the class will be fish, plants, snails, and other water life living in a clear, unpolluted lake. Play Beethoven's "Allegro Minuet in G Major" for the illusion of clean, fresh water. Have the first half of the class react to this environment by pretending that they are fish which live in that environment. They are to move, swim, eat, etc. as the music plays. The half of the class not pretending is to observe their actions.

Then the other half of the class pretends that they are fish living in a dirty, polluted lake environment. Explain that phosphates have been added to their water and garbage has been dumped in the lake. Have children visualize what they think the water would look like. Play Debussy's "Jeaux" for their background music. Again, the half not pretending observes the portrayed actions.

Following the role-playing "pretending," let the two groups discuss the feelings they had when they were pretending that they were fish. Have them recall actions they observed that they thought were especially well done. Conclude by comparing the feelings of the two groups about their "fish" environments.

Note: The teacher may prefer to just obtain one fairly even tempoed song for this activity. Play the record at the next lower speed to represent the dirty, polluted lake. (For example, if the record is a 33 rpm, play it at 16⅔ rpm to represent the dirty lake.) This will produce a slow, heavy sound to symbolize the dirty water.

Instead of dividing the class in halves, the teacher may opt to have the entire class role play both environments - clean and dirty water.

Behavioral Objectives	Focusing Questions
Children will:	
Role play fish in polluted and unpolluted water environments.	I want you to imagine that the room is a large, clear, clean lake. You are going to be fish and plants in this lake. I am going to play a record and I want you to swim and act like you think fish and plants would act in clear, fresh water. (Introduce the activity for polluted water in the same way.)
State their feelings and reactions to the two environments.	How did you feel when you were fish swimming in the clean water? In the polluted water?
Compare their feelings about the two different environments.	What were your feelings as you watched the others swimming in the clean water? Polluted water?
State their feelings and reactions to the music selections.	What things about the music made you feel like you were swimming in clean, clear water? What things about the second record made you feel like you were swimming in polluted water? (You may wish to replay a part of each selection.) In what ways did the "fish" swimming in the clean water feel different from the fish swimming in the polluted water? (Ask the same question for the plants, etc.
Draw conclusions about pollution in our rivers.	Based on what you've just said about your feelings when swimming in the polluted water, what might this tell us about depositing wastes in our rivers?

Supplementary Learning Experiences

1. Have children name some songs they sing in music class that could be used to represent clean and dirty water.

2. Use simple rhythm instruments to beat out rhythms symbolic of clean and dirty water.

3. Ask parents if they've read or heard about any polluted rivers or lakes in the United States. If so, bring names back to class and find locations on a large wall map.

4. Make two "Describing Words" lists - one list of describing words for clean water and one list for dirty water.

Content: Pollution is a relevant issue in Athens.
Materials: Guest speaker, chart paper.

Learning Experience

Have children make preparations for a program which will include a guest speaker. Discuss briefly what they have learned about water pollution and have them speculate as to what is happening in Athens concerning the pollution of our rivers. Tell them they are going to have a guest speaker come in from the Southeastern Environmental Protection Agency. You can arrange for a speaker by contacting Mrs. Hailey at 546-3127. Have the children formulate questions they want to have answered concerning the pollution of Athens' water. Write their questions on a sheet of chart paper. Then they can set up a plan as to how to conduct the program.

Consider such things as inviting other guests to come in and listen, a room in which to hold the talk, introduction of the speaker (a child could do this), etiquette to follow during the talk, possible questions to ask the speaker after the talk, etc.

Behavioral Objectives	Focusing Questions
Children will:	
Recall different causes of water pollution.	Thinking back over what we have learned about water pollution, name as many causes of water pollution as possible.
Make statements concerning the condition of the rivers in/and or near Athens.	Do you think the rivers in Athens are polluted? What makes you think that? We are going to have a speaker come in from the Southeastern Environmental Protection Agency to talk about water pollution in Athens.
Formulate questions about water pollution in Athens.	What questions would you like to ask him/her about water pollution?

Behavioral Objectives	Focusing Questions
State reasons for their questions.	How would that question lead you to know more about water pollution? (Speaker should be scheduled at this time.)
Outline a plan for conducting their class program.	Do you think we should invite guests to hear our speaker? Who? If we have guests, can we still have our program in the classroom? If not, where should we have the talk? What is the first thing we have to do when the speaker arrives? Introduce him/her? What things should we include in our introduction? How do we act when someone comes in to speak to us? (List on the board.) What questions should we ask after the talk has been completed? What things should we do after the program is over?

Supplementary Learning Experiences

1. Develop a language experience story listing the major points that the speaker discussed.

2. Have the children write thank you notes to the speaker. Go over the correct format of a thank you note.

3. Secure the book The River by Aldren Watson (Little Owl Books, Holt, Rinehart and Winston, Inc., New York, 1963). It is a picture story of a clean river and how it becomes polluted. Have a small group of children write captions for each picture.

Content: Pollution affects the lives of human beings.
Materials: None.

Learning Experience

Divide the class into five groups. Then, as a class, review what they have studied about the ways in which we pollute our streams. Ask for thoughts on pollution's effect upon our lives. Read the first of the stories provided on page 25 to the entire class and have children react to the situation explained in the story. Tell the children to pay close attention to the procedure you are using because it is what they will be doing in their groups with some other stories.

Read one story to each group personalizing the story to the members of the group. The rest of the class will listen to each reading. Tell the children they are then to discuss their story with members of their group in the same way you discussed the story about the polluted lake. After a few minutes bring the class together in order to have each group share with the rest of the class ideas concerning its story.

Behavioral Objectives	Focusing Questions
Children will:	
Recall ways we pollute our streams and lakes.	From what we have studied, what are some of the ways we pollute our streams and lakes?
Discuss how water pollution affects their lives.	How are we affected by water pollution?
Describe possible effects of water pollution on the lives of characters in the stories.	What was the cause of the situation? How would you feel if you were in this situation? What would you do? Do you think you could change the situation? If so, how? If not, why not?

Behavioral Objectives	Focusing Questions
Discuss stories in groups.	Talk about this water pollution situation with the other members of your group.
Share group ideas with the rest of the class.	What would you like to tell the rest of the class about your story and the ideas your group had concerning the situation?

Supplementary Learning Experiences

1. Have the children act out their stories for the other groups, showing their personal reactions in each situation.
2. Encourage children to ask each other questions about each situation.
3. Make up oral stories of how a polluted river could change someone's life.

Stories about Water Pollution

1. Today is the big day. You have asked your best friend to go to the lake with your family for a day of swimming. The weather is beautiful. You jump out of the car and run to the beach. In front of the swimming area is a large sign that states: WARNING: DO NOT DRINK, SWIM, OR PLAY IN THESE WATERS -- POLLUTION.

2. On their vacation Jane and Jimmy's family visited the Everglades in Florida. During their stay they noticed that there wasn't much wildlife in the park. They asked the forest ranger why all the wildlife had disappeared. He explained that most of the wildlife had died from drinking water from the polluted lake. (Locate the Everglades on a map.)

3. Mrs. Prince's class had taken a field trip to the steel factory in their city. When they left the factory they noticed that the wastes from the factory were being poured into the river. They hiked down the river and found a school of dead fish floating on top of the water.

4. Tommy and Timmy live next to a large river that runs through their city. On warm summer evenings they cannot go outside and play because there is a strong, stinky odor in the air. Sewage from the town is dumped into the river. This sewage causes the bad odor.

5. Christy lives in Cleveland, Ohio,along Lake Erie. Big freight boats carry supplies to the different cities along the lake. Sometimes these ships leak oil on the lake. When she looks at the lake she often sees big black oil slicks instead of water. The seagulls cannot dive into the water anymore because they cannot swim on the oil slicks. (Locate Cleveland, Ohio, and Lake Erie on a map.)

6. Today Mrs. Cone's class had a going-away party for Kathy. Her family is moving because they had to close down their resort. People no longer went to their lodge on vacations because the water was polluted. One could no longer fish there because the fish were dying and people were not allowed to swim in the lake.

Content: Man can counteract some of the harmful changes in our waterways.
Materials: Jar with oil slick, 3M Brand Oil Sorbant - sample a little larger than the oil slick.

Learning Experience

Have the children list some of the ways they think oil gets on our waterways. 3M Brand Oil Sorbant is useful when great amounts of oil leak out of boats on our lakes and oceans. The Sorbant is placed in great quantities upon the water surface and the oil is absorbed into the sorbant. The sorbant is then taken out of the water.

Place a piece of the 3M Brand Oil Sorbant on top of an oil slick prepared in a large jar of water. Have the children observe what happens. After the oil has been absorbed into the sorbant, take it out of the water and allow the children to feel and smell the sorbant.

Note: 3M Brand Oil Sorbant can be obtained from New Business Ventures Order Department, 3M Company, 3M Center, Building 53-3, St. Paul, Minnesota, 55101.

Behavioral Objectives	Focusing Questions
Children will:	
Speculate about how oil gets in our waterways.	How do you think oil gets in our rivers and lakes?
Observe the changes in the water and the sorbant.	What changes have occurred to the water after we added the sorbant? What is different about the 3M Brand Oil Sorbant after it was taken out of the water?
Make statements about the usefulness of the 3M Brand Oil Sorbant.	How might this new 3M Brand Sorbant help solve the problem of oil spillage? Better yet, what might man do to prevent oil spillage?

Supplementary Learning Experiences

1. Find some articles in old newspapers showing boats that have collided and left an oil slick on the water or a boat that has leaked oil on the water.

Content: One can publicize awareness of water pollution through the use of music.
Materials: Commercial jingles, simple songs for tunes.

Learning Experience

Hum or sing a popular commercial song: "You can trust your car to ... Texaco." McDonald's jingle, etc. and have the children tell you what the song is advertising. They may wish to sing the song after they guess what the commercial is. Discuss the reason for using songs in commercials rather than just telling people about the product. As a culminating activity, the children will express their feelings about water pollution in song. Discuss the ideas (theirs) the children wish to express in their song. (It is likely that the children will pick a tune with which they are familiar, such as: Row, Row, Row Your Boat; One Little, Two Little, Three Little Indians; etc. Have them all sing the original song once or twice to become more familiar with the tune. Explain that they are going to change some of the words to the song to make a new song about water pollution. The ends of the lines do not need to rhyme, but there should be the same number of beats in the new words as in the original words. An example is shown below to go to the tune of "This Land is Your Land."

This water is yours,
This water is mine,
Why do we pollute it,
Why can't we save it,
The garbage is floating,
The fish are dying,
Let us save the water now.

If you write more than one verse, you can use some of the same phrases in each verse. If you anticipate difficulties it may be wise to write your own song to direct the lesson.

Behavioral Objectives	Focusing Questions
Children will:	
Name the product(s) that a song advertises.	I am going to hum a commercial and I want you to name the product(s) being advertised.
Discuss the benefits of using songs in advertisement.	Why do you think the Texaco people advertise their product with a song instead of just telling you about their product? (Ask this question for each advertisement discussed.)
List topics for their song.	Today we are going to be song writers about water pollution. What things would you like to tell people about water pollution in your song?
Select important topics for their song.	From the ideas listed on the board, which are the most important to include in our song? (If there are too many ideas, you may like to write a couple of short songs.)
Pick a tune for their song.	What tune would you like to have your song follow?

Supplementary Learning Experiences

1. Have the children send a service telegram to their Congressman about the unit they have been studying and their concern about water pollution.

2. Put on a play dressing up as various pollutants (Mr. Phosphate, Slickly Oil, Man from Garbage) depicting their role in the polluting of rivers.

3. Write a newsletter to distribute to concerned citizens: parents, fellow schoolmates.

Level Three: Eight Year Olds
Theme B: Man and the Water

INSTRUCTIONAL MODULE 3B

MANAGEMENT OF WATER RESOURCES

MODULE GENERALIZATION: Man can manage water resources to meet his needs.

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1973

Preface

The purpose of the Primary Environmental Education Project of the University of Georgia was to develop and field test nine instructional modules designed as supplementary material for a primary level social studies program. The modules focus on teaching/learning activities that will build an understanding of the interrelationships between man and the land, water, and air. In the construction of the modules primary emphasis was given to the thinking processes of young children and the provision for many opportunities to engage in creative thinking.

Project personnel are: Everett T. Keach, Jr., and Elmer D. Williams, Co-Directors; Cheryle Johnson and Ann McCarthy, Research Associates; Marie Banks, Faye Jenkins, Carole May, and Vickie Spence, Clarke County Public Schools, Project Associates; Agnes Amos, Dycie Campbell, Judy Carter, Aurelia Fraley, Evelyn Griffin, Thelma Hurley, Margaret James, Dorothy Keach, Faye McKinney, Virginia Rogers, and Marty Shirley, Project Teachers, Clarke County Public Schools; Elizabeth Acheson, Frank Golley, E. Paul Torrance, and William Zeitler, University of Georgia, Project Consultants.

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Cover design by Sherri Hardeman, a primary level pupil at Oconee Street Elementary School, Athens, Georgia.

REQUIRED MATERIALS

Throughout this module, a variety of materials and/or arrangements will be required. Some of these may take some time to secure. Provided below is a sequential listing of the needed materials.

1. Several clear jugs (top and bottom should be same circumference), rulers, narrow tape, magic markers, newspaper clippings about rainfall measured in inches

2. Chart paper, felt pen, pencils, paper, encyclopedias, almanacs, geography reference materials, yardstick, rulers

3. Spoons or small shovels for digging, playground

4. Stalks of celery, several apples, one eggplant cut in pieces (or similar type vegetable), paper towels, potato mashers

5. Two or three strong onions, five or six hand mirrors

6. Newsprint, colored pens, globe, Georgia state maps

7. Quart or half gallon milk cartons, scissors, stapler, water, sinks

8. Several gallon jars, sand, several empty cans of different sizes

9. Bulletin board, table, two one-gallon jars, construction paper, felt pen

10. Make arrangements with Mr. Ralph Carter, Filter Plant, Water Works Drive, Athens, Georgia, (543-2364) to take the children to visit the plant, paper, pencils, list of previously composed questions

11. Art paper, crayons, bulletin board

12. Graph paper, crayons, pencils

13. Population graphs made in previous lesson, pencils, paper

Level Three: Eight Year Olds
Theme B: Man and Water
MODULE GENERALIZATION: Man can manage water resources to meet his needs.

Content: Rainfall provides much of our water supply.
Materials: Several clear jugs of the same size, rulers, narrow tape, magic markers, newspaper clippings about rainfall measured in inches.

Learning Experience

Have children bring to class weather reports that include the measurement of rainfall (9 tenths inches, etc.). Discuss briefly how rainfall is measured. Tell them that they are going to measure the rainfall in the school area over a period of several days. Have them measure off the jars by ¼ inches or by 1/8 inches, and mark the measures with tape. (Do in small groups.)

Let them decide where they should place the jugs to get the most accurate measurement. Talk about some locations that would not be good and have them explain why; e.g., putting the jar under a tree is not a good idea, putting it under a drain pipe is not a good idea. When they have decided on the places to put the jars, have the groups put them in place. Check the contents of the jars each day and compare the amounts in the different jars. After the number of days you had decided to leave the jars out, bring them back to the classroom. Have the children measure as precisely as possible the amount of water in each jar. Measurements will probably not be the same but will be close. Explain that there are precise instruments to measure rainfall and these give us the kind of information we get on the weather report.

Tell them they are going to collect some data about the amount of annual rainfall in Clarke County for the last ten years. Ask for some ideas about where that information might be found. Some may

Learning Experience

suggest the library, some the newspaper, some the television. List the ideas on the chalkboard. Have everyone make a copy of the list. Assign or ask for volunteers to gather the information by year before the next class meeting (annual rainfall for 1962 for one group, or for 1962 and 1972 for one group, etc.).

Behavioral Objectives	Focusing Questions
Children will:	
Bring to class newspaper weather reports or reports from television.	What are some of the things included in the weather reports?
Discuss the way the amount of rainfall is measured.	The reports about rainfall have been given in inches. How do you think they measure rainfall to get that kind of a measure? (Whenever possible, have them demonstrate in some way or illustrate the idea on the chalkboard.) How would you measure on a hillside? On a lake?
Choose the places best suited for catching rainfall.	Where would be a good place to measure rainfall? Let's measure the rainfall right here over (several) days.
Work in groups to mark off measures on jars to be used to catch rainfall.	Each group can decide for itself how it will show the measures on the jars. Decide also where you will place the jars for the best measurement.
Report to the class on decisions and reasons.	When you have decided, be ready to report to the class your decisions and reasons. Explain why you chose one place and why you did not choose others.

Behavioral Objectives	Focusing Questions
Check the contents of the jars each day and report to class.	How much water was in your jar today? Why are some of the measurements different from others although we were all measuring the same thing? (Made mistakes in measuring, ruler slipped, jar in the wrong place.) The weather bureau has precise instruments for measuring and that's how we got the reports. Let's find out how they do it and also collect some data (explain the term "data" if you have not used it before) on rainfall in Clarke County during the last ten years.
Suggest sources of information about rainfall in Clarke County.	Where are some places that we might find out what the annual rainfall in Clarke County has been since 1962?
Work in groups to find annual rainfall in Clarke County since 1962.	Using the list of places where you might find the data you want, bring to class the amount of rainfall for 1962-1972.

Supplementary Learning Experiences

1. Write letters or call the local Weather Bureau for information on how and where they measure rainfall.

2. From local television or radio news, chart a daily record of rainfall in the area.

3. Invite the music teacher to the class as a resource person on songs that have been written about rain. Have children listen to words and music of a few songs to decide how they think the songwriter might have felt about rain. If possible, play only music first, have children decide from music how they think songwriter felt about rain, and then listen to the words that go along with the music. (It may be possible to get two records or versions of the same song - one instrumental only; the other words with the music.) Some possible songs include: "Raindrops

Supplementary Learning Experiences

Keep Falling on My Head," "Rainy Night in Georgia," "Stormy Weather," etc.

4. Ask children to tell about how they feel about rain and/or rainstorms. See if they can talk about why they think they have those feelings.

5. Continue adding words to the class dictionary started in Module 3A, "Interdependence in the Environment."

Content: Rainfall provides much of our water supply.
Materials: Chart paper, felt pen, pencils and papers, encyclopedias, almanacs, geography reference materials, yardstick, rulers.

Learning Experience

Place chart paper in room so that all can see it. Tell the class that it is now time to organize the data they collected. Ask them to report it by the year and while one puts the data on the chart, someone else could explain where they found the information. When they have listed the annual rainfall for each year, discuss it for a while focusing on any differences. Tell them they are going to get an average per year. Have them add to get the total rainfall in Clarke County for ten years. Then have them divide by ten. When they have the average, ask if they think that is a little rain or a great deal of rain for a year. Use a yardstick and ask them to find where the water level would be on it. Provide them with a list of places where you know there is less rainfall or more rainfall than in Clarke County. Discuss in what ways rain is helpful and in what ways it could be harmful.

Behavioral Objectives	Focusing Questions
Children will:	
Organize data on annual rainfall in Clarke County.	How much rainfall did we have in Clarke County during 1962? 1963? etc. Where did you find that information?
Compare years in terms of rainfall.	What year did we have the most rainfall? What year did we have the least? How much of a difference was there between the two?
Compute the average amount of rainfall for the past ten years.	How much rainfall was there during the past ten years? What is the average amount of rainfall? (If they don't know,

Behavioral Objectives	Focusing Questions
	tell them to divide by ten.) Does that sound like a lot of rain or a little rain? Why?
Use a yardstick to show the water level of the computed average.	Use the yardstick to show where the water level of the average would be. (Others could use rulers to mark off on the chalkboard.)
Locate data about annual rainfall in other places; e.g., Tuscon, Miami, etc.	Here is a list of some other places. Use the materials here to find out how much rain falls there yearly.
Discuss differences in rainfall between Clarke County and other places.	Is it more or less than we have?
Discuss relative advantages and disadvantages of rain.	In what ways does rain help us? What people are helped by rain? In what ways can rain be harmful? What people might be harmed by rain? How do you feel about rain?

Supplementary Learning Experiences

1. Have children collect magazine or newspaper pictures of places where rain has been helpful and places where rain has been harmful.

2. Have the class observe the streets where rain water runs down. Where does it run to eventually? Point out the places where rain causes flooding. Have them try to figure out why that happens there.

3. Read to the class The Beaver Pond by Alvin Tresselt (Lothrop, Lee and Shepard Co., New York, 1970). A community's changes are illustrated as a pond forms from the work of the beavers and changes back when the beavers' dam is washed away.

Content: Water is stored naturally in the earth.
Materials: Spoons or small shovels for digging, playground.

Learning Experience

Briefly recall with the class the activities they did previously in their search for water. Explain that now they are going outside to look for some places where water can be found. (Where they will find water will depend on how recently it has rained.) They may see water in puddles, streams, etc. If not, then they can feel the earth in different places; e.g., near drain spouts. Where it is dry, suggest that they dig down a bit and feel the earth there, too. When the children return to the classroom, give them a few minutes to make lists of their discoveries. Then let them talk for a while about what they discovered.

Behavioral Objectives	Focusing Questions
Children will:	
Look on the school grounds for evidence of water.	How did we know where there was water? (We saw it. We felt it.) Let's look on the schoolgrounds and try to find where the water went after the last rain. Can you see any water? (If there has been rain, there may be puddles, etc.)
Feel the earth looking for water.	Are there any places where you can't see water but you can feel it? (Under the grass, near the plants?)
Dig under the dry places looking for water.	Try digging under the dry soil and feel the earth there.
List the places where they discovered water.	We went outside looking for water. Take a few minutes to jot down a list of places where you discovered water.

Behavioral Objectives	Focusing Questions
Discuss the outdoor activity, telling what they discovered about where some of the water is stored.	Now let's share with the class. What were some of the things you discovered out there?

Supplementary Learning Experiences

1. Read to the class, Rain Drop Splash by Alvin R. Tresselt (Lothrop, Lee, and Shepard Co., New York, 1946), a well-illustrated easy-reading story about rain.

2. Collect three different soil samples; e.g., sand, clay, and loam. Pour same amount of water on each soil sample. Compare the ability of the different soils to quickly soak up the water.

3. Explain to the class how water soaks down into the soil until it reaches bedrock and then flows downhill until an open space is reached; e.g., lake, stream, sea.

4. Have the children consider what happens to some of the rain water that doesn't soak into the ground. Explain the term "evaporate." Perhaps you might set up a class experiment; e.g., two glasses of water, one covered, and one uncovered - measure the amount of water each day.

Content: Water is stored naturally in plants.
Materials: Stalks of celery, paper towels, potato mashers, several apples, one eggplant cut in pieces.

Learning Experience

Divide the class into several groups so that all in a group will be able to see and touch materials easily. Give each group paper toweling, celery stalks, and a potato masher. Tell them to place the stalk of celery on the paper towel and observe it. (Be sure it is quite dry). Then have them break the celery stalk and place the ends on the paper toweling. It will show a wet spot. Then have them mash the celery. They will see water squirt out of it and the paper towel will be quite wet. Repeat the process with the eggplant and the apples (or some other available vegetables and fruit). Have them note the difference in the amount of water contained in each. Then have the children suggest other plants that might contain water. Ask children to devise an experiment to check out their suggestions that they could conduct at home. Report findings to the class.

Behavioral Objectives	Focusing Questions
Children will:	
Work in groups to test celery for water content.	What happens when you put the celery on the paper towel? Now break the stalk of celery in two and place the ends on the towel. What do you notice now? (Do this several times so that the pieces are smaller.) Using the potato masher, squash the piece of celery. What did you see happen? What effect did it have on the paper towel? Why do you think that happened?

Behavioral Objectives	Focusing Questions
Observe the effects of other fruits and vegetables on the paper towel.	Does _____ contain much water? (Repeat for other vegetables and/or fruits tested.)
Note differences and similarities in water content of fruits and vegetables.	In what ways were they different? In what ways were they alike?
Identify other plants (fruits or vegetables) in which they have found water.	Besides these, what other things can you think of that might have water in them? How can you find out?

Supplementary Learning Experiences

1. Ask each child to look in the closet at home or at the grocery store for foods that have been concentrated by removing water from them. (packaged soups, instant tea, etc.)

2. Discuss the purposes for concentrating food; e.g., storage, transportation, saving of space, refrigeration costs, etc.

3. Bring in packages of Kool-Aid and have children fix it by adding water.

4. Have the children place celery stalks in water colored by red and blue food coloring so they can watch the effects of absorption.

Content: Water is stored naturally in people.
Materials: Two or three strong onions, five or six hand mirrors, chalkboard space.

Learning Experience

Recall with the class the lessons on rainfall. Ask them to think about where all that water has gone. Tell them they are going to hunt for some of the water that is still here but cannot be seen. Group them in threes or fours depending on class size. Tell them to work together and that they will report later what they have observed. Have some groups use the chalkboard and some use hand mirrors. Tell them to breathe on the board or the mirrors and identify any changes.

Give a freshly cut piece of onion to one in each group. As they all come close to the piece of onion, they are to observe each other carefully. Next, direct the children to do a vigorous exercise. It might be running briskly in place or doing deep knee bends. This should be continued long enough for them to begin to perspire. If weather permits, this activity could be part of a recreation period outside. Keep in mind that the activity should induce perspiration. Give them a few minutes to rest from the exercises and then bring them together for a discussion. Refocus children on the idea of looking for water.

Behavioral Objectives	Focusing Questions
Children will:	
Hypothesize about where all the rainfall has gone.	Where do you think the rain water has gone?
Work in small groups observing activities.	Let's play detective and see if we can find out where some of the water is located.
Breathe on hand mirrors or chalkboard and identify ways in which they changed.	When you breathe on the mirror and the board, what do you notice about it

Behavioral Objectives	Focusing Questions
	that's different from the way it was before?
Bring freshly cut onions near their eyes.	What are some differences that you notice when you come close to the onion?
State conclusions as to where some water is located (following strenuous exercise).	What do you notice about yourself or someone in your group now that you have been running? Have the detectives found any evidence leading to the discovery of where some of the water is stored?
Support statements by reports of observations of activities.	What did you see or feel that makes you think that?

Supplementary Learning Experiences

1. Have children observe grapes and raisins and dried apple slices and fresh apple slices for differences and explain the term "dehydrated." Ask them to imagine how they would feel and look if they were dehydrated.

2. Draw a picture of how you think you would look if you were dehydrated.

3. Invite the school nurse to the classroom to discuss causes of dehydration of the body.

Content: Water in Georgia is stored in streams, lakes, rivers, oceans, etc. At times man builds dams for the purpose of storing water.

Materials: Newsprint, colored pens, globe, Georgia state maps.

Learning Experience

So far the children have seen how water is stored in people, plants, and in the soil. To introduce water storage in lakes, rivers, etc., have children think about where they could find water for swimming, boating, water skiing, a boat trip, etc. Distribute the Georgia state highway maps so that the children are looking at them in groups of threes or fours. Be sure that in each group there is at least one child who can read so that he can help those who can't. Display one map in the room so that all the children can see it. Talk a little about the map, first explaining that it is a representation of the state of Georgia. Ask them what part of the map shows land and what part of the map shows water. (If they don't know, tell them). Draw a large black circle around Athens and then point out directions from Athens; north, south, east, and west. Have them imagine that they are taking an automobile trip from Athens directly east. They can trace with their fingers a straight line to the east. Then ask if they found any water bodies on the way. If you feel it is necessary for the class, you could repeat this for north, south, and west until they are all aware of direction and the presence of water bodies. Tell them they are planning a trip and ask them to locate some places where they could engage in water sports. Allow sufficient time to look over the maps thoroughly and talk about where they would like to visit. On the newsprint, draw an outline of the State of Georgia. Mark on it only the directions north, south, east, and west. Have each group of children come up and place on the large map a location they would like to visit. They can tell the class what it is and why they are going there. They can also tell in what direction they would have to travel from Athens to get there.

Behavioral Objectives	Focusing Questions
Children will:	
Examine Georgia state maps.	This map is a picture of our state. How do we know on this map what parts

Behavioral Objectives	Focusing Questions
	are land and what parts are water? (Some may know; if not, tell them.)
Trace on the map a course from Athens due east, west, north, and south.	Let's put a circle around Athens - the place where we live. From here, if we traveled this way we would be going east (mark it as you say it).
Identify water bodies they passed on that course.	Imagine you are starting out on an automobile trip headed east. Trace with your finger a straight line east. What water bodies did you see on your trip? (Do the same with west, south, and north.)
Choose from the map places in Georgia where they could engage in water sports.	You said before you'd like to enjoy some water sports like fishing, boating, swimming, etc. Where could you have these in Georgia? Look at the map and each group decide where you are going to visit.
Draw on the class map the water bodies they have chosen.	We have a class map just for the places we found to visit. Each group come up and place on the map the location you've decided to visit for your water sports.
Tell in which direction each place is from Athens.	Look at Athens on the map. In which direction will you have to travel to get there?
Examine a globe for the water bodies of the earth.	We have looked at Georgia for water bodies. Now let's look at the globe -- a tiny model of the earth. Where are the water bodies on the earth?

Supplementary Learning Experiences

1. For children who are interested, explain that roads are assigned numbers. Have them plan trips by reference to specific road numbers as well as directions. (Point out that in the United States Interstate Highways running east-west are given even numbers, and those running north-south are given odd numbers.)

2. Have children draw a simple map of the classroom numbering the aisles and passageways. Then have them trace by number the ways they move about in the room during the day. You could gradually move on to maps of the school, neighborhood, town, etc.

3. Explain how the map scale works so that they can tell how many miles apart places are by the number of scale lengths or the fractional part of a scale length the places are distant from each other on the map. Let those who are able work out distances.

4. Read the book Rivers by Delia Goetz (William Morrow and Co., New York, 1959) to the class.

5. If children are familiar with the grid system, call out (one at a time) the grid locations of bodies of water in the state and have children tell the names of the bodies of water.

Content: Man stores water for future use.
Materials: Quart or half gallon milk cartons, scissors, stapler, water, sinks.

Learning Experience

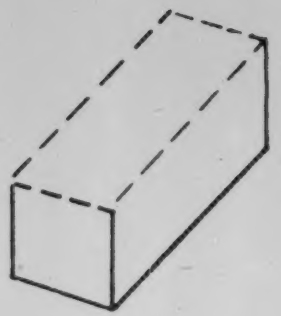
Review the previous concepts of the natural storage of water. Have the children hypothesize about what would happen if we had little or no rain for a long time. They will probably suggest that everything would dry up and the natural storage places like streams, lakes, etc. would not be enough for our needs. To introduce the idea of planned water storage, ask what we can do to make sure we have enough when we need it. The children will probably suggest some means of saving it when we do have rain. Introduce the word dam and tell them this is one of the ways we save water so we will have it when we need it. Distribute the necessary materials and let the children construct their own paper dams (following or coinciding with a teacher demonstration). After the children have seen how a dam operates, discuss with them how this is a way to save water.

Behavioral Objectives	Focusing Questions
Children will:	
Hypothesize about what would happen if we had no rain for a long time.	What are some things that might happen if we had no rain for a long time?
Suggest ways we might prepare for a time of little or no rain.	What could we do to make sure we would have enough water even if it was a dry season?
Construct dams from milk cartons.	Let's take a look at one of the ways we save our water so we can use it later.

Directions:

1. Cut out one side of the carton (on the length).

1.

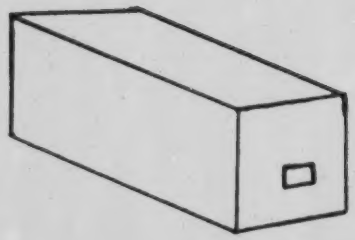


2. Out of this side, cut two pieces. Each should be one inch wide and two inches long. Save the rest of the side.

2.

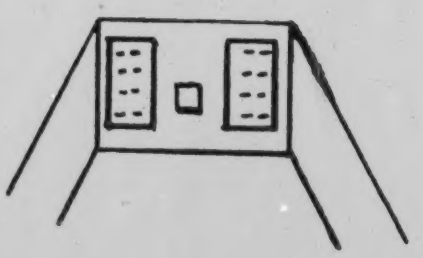
3. At the closed end, cut a square ½" wide and ½" high.

3.



4. Fasten the two pieces, one at each end of the square hole, on the inside of the carton. Use staples. (Do not staple closely to edges nearest the opening.)

4.

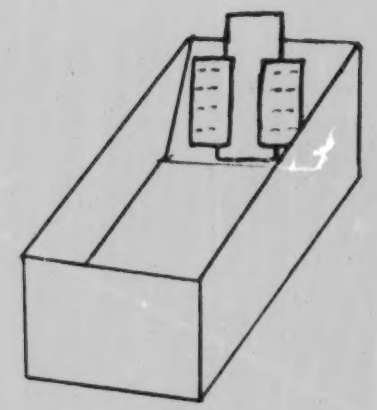


5. From the remainder of the side, cut a long strip. This strip should be just wide enough to fit snugly behind the two pieces.

5.

6. Put the long strip in place, so that it covers the square hole.

7. Fill the carton with water. and open or close the gate controlling the water. Explain that on real dams the gates are very large and would be controlled by machinery.



Behavioral Objectives

Children will:

Enumerate ways that a dam can be used.

Focusing Questions

We have now seen how a dam operates. Now in what ways might this be used to help solve our water problems?

Supplementary Learning Experiences

1. Have children look up information about dams, where they are, why they are located there, how they are used. The Army Corps of Engineers is a good source of information. Their local address is: 30 Pryor Street, S. W., Atlanta, Georgia, 30303.

2. Explain the term hydroelectric power and show how dams are utilized to produce electricity.

3. Read to the class Let's Go To a Dam by Lee Hamilton (G. P. Putnam's Sons, New York, 1963). The reader is taken on a trip to see how a dam is built, how it works, and the purpose it serves.

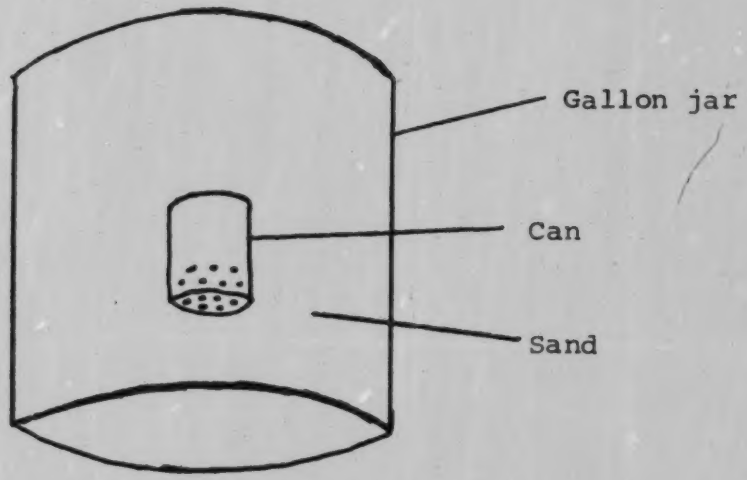
Content: Man stores water for his use.
Materials: Several gallon jars, sand, several empty cans of different sizes.

Learning Experience

Review briefly the storage of water and how dams help us to have water when we need it. Explain that we will now examine another way in which we can store water - water that is underground.

Punch a number of small holes in and near the bottom of the tins. These are like wells. Fill the jars three-fourths full of sand. Sprinkle water into the jars until the sand is soaked. Keep sprinkling water until the well is full. Encourage children to make their own wells at home. They could explain to their families how a well operates.

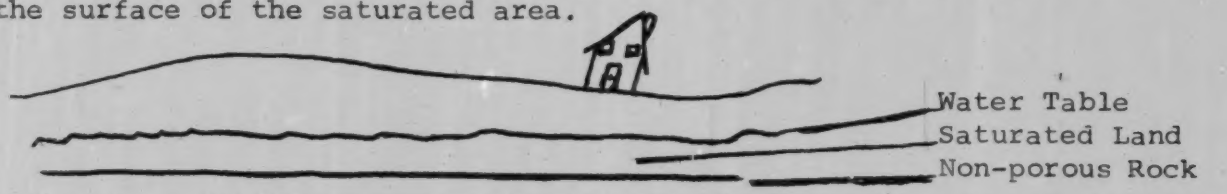
Note: Do as many as you can manage. It would be preferable for each child to make a well or each pair of children to make one. Demonstration by the teacher is not as effective.



Behavioral Objectives	Focusing Questions
Children will:	
Discuss the previous activities concerning the storage of water.	What are some of the ways we saw that water is stored? When we built our own dams, we could see how man stores water. Now let's take a look at another way we store water underground. These are called wells.
Observe and describe what happens in the well when the jar is filled with water.	What do you see happening to the water? What is happening inside the well?

Supplementary Learning Experiences

1. Explain by demonstration the meaning of the term, "Water table." Use any kind of wide jar or aquarium tank. Mix some sand and soil and put in the container so that a well is formed. Begin to sprinkle water like rain. Have children observe effects until they see water has soaked to the bottom. Explain that the glass bottom is non-porous and when water reaches the non-porous rock, the water table is the surface of the saturated area.



2. Have the class discuss some factors they would have to consider before deciding where to put a well.

3. Explain to the children what a "divining rod" is and what people believe about it. Compare it with more scientific methods.

4. Explain to the class that wells were once used for refrigeration. Have them discuss why people would have done this.

Content: Most communities must purify its water supply before using it.
Materials: Bulletin board, table, 2 one-gallon jars, construction paper, felt pen.

Learning Experience

Arrange to have a blank bulletin board. In front of it put a table on which the gallon jugs are to be placed at either end. Fill one jar with water from the Oconee River (the dirtier, the better) and the other with clear water from the tap. Label each jar clearly. Bring the children's attention to the contents of each jar. After they have discussed the similarities and differences, announce that the water in both jars is from the Oconee River. Do this in a dramatic way and then let them talk spontaneously about the discovery. Allow a little time for them to talk about this together deciding on what questions they'd like to ask about it. As they ask questions, write the questions on pieces of construction paper and tack them on the bulletin board. Make the writing large enough so all can see the questions with ease. Now ask them to look at all the questions and decide which ones are closely related. Once they are grouped, have the children decide in which order they should be answered. Have them suggest ways to find out answers. If no one thinks of it be certain that they consider a local telephone book. Have them check out the suggested sources.

Behavioral Objectives	Focusing Questions
Children will:	
Identify similarities between the two jugs of water.	In what ways are the contents of these two jugs alike?
Identify differences between the two jugs of water.	In what ways are the contents of these two jugs different?
Choose the jug which would be better for a drink.	Which of these would you choose for a drink?

Behavioral Objectives	Focusing Questions
State reasons for their choices.	Why would you choose that one (not choose the other one)? Now there is something very important for us to know. The water in the clear jug came from the Oconee River. The cloudy water in the other jug came from the Oconee River also.
Discuss together to decide what questions they have about the Oconee providing our water supply.	Talk together for a few minutes. What questions would you like to ask about this?
Group questions that are closely related.	Which of these questions could we group together because they are alike or nearly alike?
Arrange groups of questions in the order in which they should be answered.	Keeping in mind that we want to know about the Oconee River and our tap water, which of these questions should we have answered first? Which should we have answered next? Etc.
State reasons for the order in which they place the groups.	Why do you think it's important for us to know that first?

Supplementary Learning Experiences

1. Have the class consider things other than man which need water to survive.
2. If there was no rain for a long time and water was scarce, what would be some ways we could conserve water? How could we provide water for birds and animals?

Supplementary Learning Experiences

3. Make a chart containing questions they asked during the learning experience, answers they found, and their sources of information. Continue completing the chart following the visit to the filtering plant in the next learning experience.

Questions	Answers	Sources
1.	1.	1.
2.	2.	2.

Content: Most communities must purify its water supply before using it.
Materials: Filtering plant, papers, pencils, list of questions.

Learning Experience

Make arrangements with Mr. Ralph Carter, Filter Plant, Water Works Drive, Athens (543-2364) to take the children to visit the filtering plant. Be sure to have as many adults as possible to accompany the children. Explain to the class that you are going to take a trip to the filtering plant that makes our water fit to drink. Briefly review the questions they previously asked about Oconee River water and encourage them to ask about them at the plant. Have a copy of their questions with you when you go to the plant. Here they will find the answers to most of the questions asked. The children should bring pencils and paper so they can make notes on the answers to their questions. After returning from the plant, have the children focus again on the Oconee River water and the tap water and make some general statements about what they have learned.

Behavioral Objectives	Focusing Questions
Children will:	
Visit the filtering plant for answers to their questions about Oconee River water and our tap water.	Be sure to ask any questions you may have while we are at the filtering plant. Make notes of the answers so that we can talk about them when we go back to school.
Make summary statements about our water system based on their experiences.	Now that we have seen our local filtering plant what are some of the things you know about the water supply that you didn't know before? (Focus on safety, availability, etc.) Based on all the things that you have learned, what can you say about our water system?

Behavioral Objectives	Focusing Questions
State their feelings about the water supply.	How do you feel about our water supply now?
State reasons for their feelings.	What makes you feel that way?

Supplementary Learning Experiences

1. Compose a letter thanking their guide at the filter plant. They could suggest the contents, the teacher could write the letter on the chalkboard, and children could then copy the letter and select one to send from the group.

   or

2. Have children work in groups of three or four to make group letters. In each group assign one child who is able to read and write easily. Send each group letter.

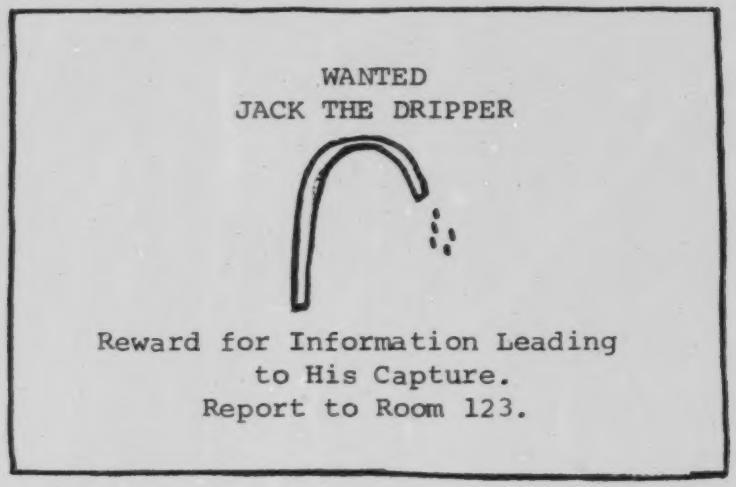
3. Invite a guest to the class (science teacher, principal) for discussion about their field trip so that they can explain what they experienced to someone who has never been there.

4. Build a cardboard model of the filtering plant.

Content: Man "wastes" water.
Materials: Art paper, crayons, bulletin board.

Learning Experience

Having taken a trip to the filtering plant, the children should now be aware of the tremendous amount of work involved in supplying the local population with clean water. Now we want them to focus on the way we use water. They should now begin to be aware of the "wasting" of our water supply. Tell them that they are going to be "water waste watchers." They are to watch to see how many ways people use water during a day. They are also to check on how many ways people "waste" water. The next day they will report their findings to the class. Ask them to consider what might happen if "wasting" water were a crime. Group them in threes or fours where they act out someone using water and the "water waste watcher" catches them and makes them pay a fine or puts them in jail. Distribute materials for children to make posters for use in the school. The theme of the posters will be "Wanted." They should illustrate some misuse of water on the poster as well; e.g.,



Behavioral Objectives	Focusing Questions
Children will:	
Identify situations where water is being used in a "wasteful" way.	You are all to be "water waste watchers." Watch for a day to see how many ways people use water. Watch also for times when we "waste" water. Make a list of this information and bring it to class tomorrow.
Hypothesize about what might happen if the "wasting" of water were a crime.	What are some things that might happen if wasting water were a crime?
Dramatize situations where water is being misused.	Let's act out what it would be like if wasting water were a crime.
Draw posters depicting various misuses of water as crimes.	Pretending to look at those who waste water as criminals, let's make some WANTED posters for around the school.

Supplementary Learning Experiences

1. For each of the ways children saw water being wasted, ask them to propose a technique or action that could prevent further wasting.

2. It is likely that the examples of water wasting will all be personal ones. Ask pupils to think about some ways businesses waste water (restaurants, fountains, over-watering public lawns and gardens, etc.)

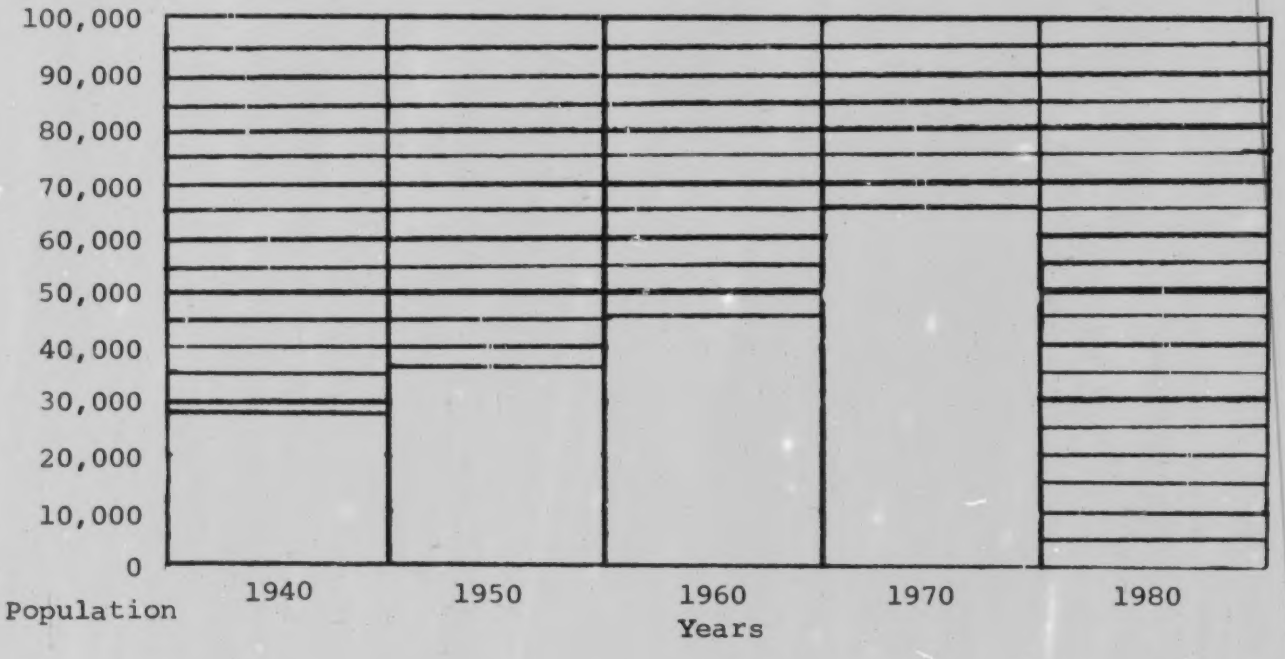
3. Ask the children to consider places where or times when wasting water might be considered a real crime. Have them explain why.

Content: The growing population of Clarke County places a greater demand on our water resources.

Materials: Graph paper, crayons, pencils.

Learning Experience

This activity is designed to bring the children to an awareness of the demand the growing population places on our ability to supply clean water. Explain that they are going to make charts to show how many people live in Clarke County. Develop one very large population graph on newsprint while the children do individual graphs on the graph paper. Work with them to develop the graph scale as pictured. Then write on the chalkboard the population data: 1940 - 28,398; 1950 - 36,550; 1960 - 45,363; 1970 - 65,177. Explain that the line between 10,000 and 20,000 represents 15,000, etc. Do each step of the graph on the large class graph as the children do it on their individual graph paper. Use subtraction to compare population statistics. Hypothesize about the population of Clarke County in the year 1980.



Behavioral Objectives	Focusing Questions
Children will:	
Identify some things they notice about the number of people in Clarke County.	What are some things that you notice about the numbers of people in Clarke County?
Use subtraction to compare the population figures.	What was the difference between the number of people in 1940 and 1950? in 1950 and 1960? in 1960 and 1970? Compare the population growth from 1960 to 1970 with the growth from 1940 to 1960.
Hypothesize about the growth of population from 1970 to 1980 based on the graphs.	Looking at these population figures and thinking back over the comparisons we have made, what do you think the population of Clarke County will be in 1980?

Supplementary Learning Experiences

1. Explain to the class that there are many ways to graph information. Have them show the data by means of a line graph and compare the graphs for clarity.

2. Help the class construct a pictogram of the population data. Explain that a pictogram is a symbolic picture of the data; e.g., for population, for trees or forest land, etc. Round off the data to the nearest thousand and let each symbol represent 10,000 or 15,000.

3. Compare the three types of graphs. Ask pupils, "In what ways are they similar? In what ways are they different?" Find out which method of graphing the children like best and why. Which one is most accurate? Why?

Content: The growing population of Clarke County places a greater demand on our water resources.

Materials: Population graphs made in previous lesson, pencils, paper.

Learning Experience

Use the population graphs made in the previous lesson. Briefly review with the class some of the things they figured from the graph on the growing population of Clarke County. Explain to the class that it has been estimated that each person uses about 100 gallons of water per day. Ask the focusing questions provided below. Allow ample time for the class to discuss with each other and with you the significance of their findings about the water supply.

Behavioral Objectives	Focusing Questions
Figure the number of gallons of water used per day by their families, their class, school, etc.	If we each use about 100 gallons of water per day, how many gallons does your family use per day? per week? per month? How many gallons does our class use per day? per week? etc.
Figure the number of gallons needed in 1940, 1950, 1960 and 1970.	Using our population graph, how many gallons of water per day did persons in Clarke County use in 1940? 1950? etc?
Hypothesize about the amount of water that will be needed to serve Clarke County in 1980.	How many gallons of water do you guess (estimate) that we will need in 1980?
State conditions necessary to supply water to the growing population.	What will have to happen before we can supply that much water?
State reasons for the proposed conditions.	Why do you think so? We have looked at the facts and figures about our population and the water supply. What are some ideas you have as a result?

Level One: Six Year Olds
Theme C: Man and Air

INSTRUCTIONAL MODULE 1C

AIR - SUPPORT FOR MAN'S ACTIVITIES

MODULE GENERALIZATION: The air provides support for man's activities.

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1973

Preface

The purpose of the Primary Environmental Education Project of the University of Georgia was to develop and field test nine instructional modules designed as supplementary material for a primary level social studies program. The modules focus on teaching/learning activities that will build an understanding of the interrelationships between man and the land, water, and air. In the construction of the modules primary emphasis was given to the thinking processes of young children and the provision for many opportunities to engage in creative thinking.

Project personnel are: Everett T. Keach, Jr., and Elmer D. Williams, Co-Directors; Cheryle Johnson and Ann McCarthy, Research Associates; Marie Banks, Faye Jenkins, Carole May, and Vickie Spence, Clarke County Public Schools, Project Associates; Agnes Amos, Dycie Campbell, Judy Carter, Aurelia Fraley, Evelyn Griffin, Thelma Hurley, Margaret James, Dorothy Keach, Faye McKinney, Virginia Rogers, and Marty Shirley, Project Teachers, Clarke County Public Schools; Elizabeth Acheson, Frank Golley, E. Paul Torrance, and William Zeitler, University of Georgia, Project Consultants.

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Cover design by Sherri Hardeman, a primary level pupil at Oconee Street Elementary School, Athens, Georgia.

REQUIRED MATERIALS

Throughout this module a variety of materials and/or arrangements will be required. Some of these may take some time to secure. Provided below is a sequential listing of the needed materials.

1. Balloons (one per child), two paper bags

2. Straws (one per child), small pieces of paper, balloons (one per child)

3. Story (provided), straws, seeds

4. Two growing plants (perhaps mung beans left over from an earlier module), two large jars, water, chart paper, sand

5. Electric fan, chart paper

6. One picture of a child using air for fun, sheets of 9 x 12 white drawing paper, scissors, crayons, construction paper

7. Globe or world map, opaque projector, pictures or model of Boeing 747, encyclopedia or information book on airplanes

8. Saucer, candle, jar

9. None

10. Pictures of windstorms (hurricanes, tornadoes), Time of Wonder by Robert McCloskey (Viking Press, New York, 1957)

11. Experience chart paper, magic marker

Level One: Six Year Olds
Theme C: Man and Air
MODULE GENERALIZATION: The air provides support for man's activities.

Content: Air cannot be seen, but is all around you. Air can be felt.
Materials: Balloons (one per child), paper bags.

Learning Experience

Ask children to tell what air looks like if they've ever seen it. Ask children if they could find some air and show it to the class so that the class might see what it looks like.

Have children move their hands through the air rapidly and then tell if they could feel anything. Blow up a medium-sized paper bag. Close the top and let children feel the bag. Have children compare this bag with an unfilled bag. Ask, "What makes the difference?"

Give each child a balloon and instruct him to blow up the balloon and then feel it. Compare the inflated balloons with a deflated balloon.

Have children tell about other times they have felt air.

Behavioral Objectives	Focusing Questions
Children will:	
Tell what air looks like.	What does air look like? If you wanted to show the person next to you what air looks like, how would you do it?
Wave their hands in the air and tell what they felt as they moved their hands.	Let's wave our hands in the air. What did you feel when you did that?
Identify differences between an inflated bag and a deflated bag and state reasons for their responses.	What is different about these two bags? Why do you think they are different?

Behavioral Objectives	Focusing Questions
Identify differences between inflated and deflated balloons and state reasons for their responses.	What is different about these two balloons? What makes them different?
Recall experiences of feeling air.	Think for a minute about any time you have ever felt air. Let's listen to a few people tell us about the times they felt air.

Supplementary Learning Experiences

1. Display several pictures of air. Include pictures of clean, fresh air and dirty, polluted air. Ask children to choose the air they would prefer to have around them. Have them explain their choices.

2. Read Air Is All Around You by Franklyn M. Branley (Crowell Publishers, New York, 1964).

Content: Materials can be moved from one point to another by air.
Materials: Straws (one per child), small pieces of paper, balloons (one per child).

Learning Experience

Have children direct a stream of air from a drinking straw against some small pieces of paper. Do the same with a stream of air from an inflated balloon.

Have the children think of and demonstrate other ways they could use air to move the pieces of paper. (Examples: blowing; fanning with home-made or commercial fans; opening nearby window; mashing milk carton or similar paper or plastic container with small hole for escape of air; making toy windmills, toy parachutes, or toy airplanes, etc.) Have individual students explain how they might set up an experiment or demonstration outside the classroom to show that air moves things. Select a few of the pupil experiments and conduct them.

Behavioral Objectives	Focusing Questions
Children will:	
Work in pairs blowing through straws and letting the air out of the balloons.	What happened to the paper when you blew air through the straw? . . . when you let the air out of the balloon?
Demonstrate other ways they could cause air to move the paper.	What other ways could you show us that air moves the paper?
Propose situations where they could demonstrate that air moves things.	Think about some things that are outside. What are some ways that you could show that air moves things?

Supplementary Learning Experiences

1. Begin a "calendar of air movement." Let the children propose symbols to represent windy, calm, rainy, etc. Each day at a specified time check the sky and record the appropriate symbol. At the end of a month, look at the calendar and summarize what the month was like.

2. Go on an observation tour to watch for and take note of evidence that air can move things.

Content: Materials can be moved from one point to another by air.
Materials: Story, straws, seeds.

Learning Experience

Tell the children that you are going to read a "mystery" story to them. After you have arranged them for story telling, read the story provided on page 6. After you have read the last line, give them a few minutes of silence to think about the story and the question. Then ask the question again and make a record of their answers on the chalkboard. If they do not propose that seeds were carried by air, be more direct in your questions.

If the weather permits, the next phase of this learning experience could be done outside using parts of plants that actually are seeds or seed carriers. If not, do it in the classroom. Distribute straws and some seeds. Divide the class in half - facing each other. In groups, have them blow through the straws forcing the seeds to the other side of the room. (Milkweed, butterfly bush, dandelion, etc. are very good for this purpose as they can be "tracked.")

Behavioral Objectives	Focusing Questions
Children will:	
Hypothesize about how the flowers got into the garden.	Who can help him solve the mystery? How did those flowers get into the garden?
Simulate the action of air displacing seeds.	Use these materials to show how air can move seeds from one place to another.

Mystery Story

Once upon a time there was a little old man who lived all by himself on a lonely road just outside of town. His house was set so far back among the trees that if you passed by, you would not even know there was a house there at all. Behind the house was a big open field where very little except a few weeds grew. One day the little old man decided to make a vegetable farm out of it. He would turn over the ground, clear away all the stones, and get the field ready to become a farm. Each morning he would go out into the crisp autumn air and work on a little piece of land until finally it was completed.

When winter came a snow covered the field like a furry white blanket. This made the little old man happy. He thought about what a good vegetable farm he would have with all that soft snow soaking down on it. Indeed, he was right. It was good farm land.

As soon as the days were warm enough, he hurried out to plant his seeds. There were rows of tomatoes and rows of cabbages. There were sections of string beans and clumps of carrots. Now all he had to do was wait for the seeds to grow, and he would have enough vegetables to last him all winter.

Each morning when he got up, he would hurry to the window to see if the vegetables had popped up out of the ground. One morning he went to the window as usual. He saw a strange but beautiful sight. The tomatoes were up; the cabbages were up; the string beans were up; even the carrots were up. But everywhere he looked there were tiny golden flowers. He never planted those! Where could they have come from? Who could help him solve this mystery?

Supplementary Learning Experiences

1. Take the class to several good "listening" places. Have them describe and compare sounds they hear. Which sounds are pleasant? Unpleasant (noise)? Can anything be done to correct the unpleasant or polluted sounds? (Point out that sounds, as well as materials, can be carried from one point to another by air.)

Supplementary Learning Experiences

2. Have children make a list of about ten sounds. Have each child decide whether he thinks each sound is pleasant or unpleasant. Use a happy face ☺ to mark pleasant sounds and a sad face ☹ to mark unpleasant sounds.

3. Assign children (with the help of a parent) to make a list of sounds heard at home. Bring lists to school for comparison.

4. Go through magazines to find one picture that suggests a pleasant sound and one picture that suggests an unpleasant or polluted sound.

5. Read the poem "Airlift" by Aileen Fisher (In the Woods, In the Meadow, In the Sky, Charles Schribner's Sons, New York, 1965, page 52).

Airlift

Over the meadow,
Over the clover,
An airlift goes
Till the day is over,
Heavy with freight
When skies are sunny -
Thousands of bees
Are making honey!

Following reading of the poem, ask children, "What moved things through the air?" Explain the terms "airlift" and "freight." Point out that in this case, bees were flying through the air carrying materials needed to make honey. Read the poem again. Let children volunteer to read.

6. Read Seeds By Wind and Water by Helene S. Jordan (Crowell Publishers, New York, 1962).

Content: Living things need air in order to survive.
Materials: Two growing plants (perhaps mung beans left over from earlier module), two large jars, water, chart paper, sand.

Learning Experience

Ask children to hold their breath. Tell them that when they can't hold their breath any longer, they are to raise a hand and continue breathing as normal. Talk about how they felt when they were not breathing in any air. Ask, "What could happen if you continued holding your breath for a long time?" or "What could happen if you were trapped in a small space without any openings for more air to get in?" Recall other occasions when students have had to hold their breath.

Tell children that now they are going to find out if plants also need air. Then take two small potted plants of any variety other than water plants (two mung bean plants left over from earlier lessons could be utilized) and fill the pots they're growing in with sand. Place each potted plant in the bottom of a large jar (large wide-mouthed jars can generally be obtained from school cafeteria personnel). Slowly add water to one jar until the plant is entirely covered by water. Label the two jars as "control plant" and "experimental plant."

Control Plant

Experimental Plant

Observe the two plants for several days. (Plant submerged in water should begin dying in 4-6 days). Note any changes in the two plants on chart paper. Focus concluding discussion on the cause of death for the plant submerged in water.

Behavioral Objectives	Focusing Questions
Children will:	
Experiment to see how long they can hold their breaths.	When I give the signal let's all take a deep breath and try to hold it as long as you can. As soon as you let it out, raise your hand.
State what feelings they had when they did not breathe.	What were some feelings you had while you were not breathing as usual?
Hypothesize about what feelings they might have if the air were cut off and state reasons for their responses.	Imagine you were trapped in a tiny space where there was hardly any air. What do you think your feelings would be? Why do you think you would feel that way?
Act out their imagined feelings.	Act out your feelings in movement and sound.
Observe an experiment to find out if plants need air.	We are going to do an experiment to see if plants need air. Watch closely to find out how we cut off air from the experimental plant.
Identify any changes in the plants.	What are some things that have happened to the plants since we started our experiment? What are things about them that are different now?
State conclusions about the causes of the experimental plant's death.	What would you say are the main reasons for the death of this plant?

Supplementary Learning Experiences

1. Obtain two nearly identical potted plants. Coat the leaves of one plant with vaseline. Observe and compare the two plants each day. Why did the vaseline-

coated plant wither? Then imagine that the plant had been growing outdoors. What might clog up the little openings (stomata) of the leaves and cause the plant to die outdoors?

2. Make up an experiment to find out if animals other than humans need air for survival. Then have children decide if they would actually conduct such an experiment. Define and discuss the term "humane." Point out the word in the names of such organizations as Athens Humane Society, etc.

3. Think of situations when it would be advisable to take an extra supply of air (oxygen) with you; e.g., deep water diving, going into a blocked tunnel or cave, airplanes, etc. Find out how air is stored for use in such situations.

Content: Moving air can cool the body.
Materials: Electric fan, chart paper.

Learning Experience

Note: If possible conduct this lesson immediately following a recess or physical education period which has included some strenuous exercise.

If it is not possible to conduct this activity after recess or a physical education period, begin the lesson with yourself or a student leading the group in some classroom exercises. Once students have started to become warm, begin a last exercise. During this last exercise students are to come up and stand in front of the fan in groups of about three. Others will continue to exercise while groups come to the fan. Just before the final exercise explain to children that when they stand in front of the fan they are to notice any changes in the way their body feels. During the last exercise bring groups of three in front of the fan for about 15 seconds. Then direct them to their seats while other groups come to the fan. Following this activity ask the focusing questions suggested below.

Title a piece of chart paper, "Words that Describe Feelings." As children describe how they felt when they stood in front of the fan, add those words to the chart. Explain that these are "describing" words; they describe or tell how people felt.

Ask children to recall other times when moving air, wind, etc., made their bodies feel cooler.

Behavioral Objectives	Focusing Questions
Children will:	
Perform some vigorous exercise.	Today we are going to do some exercises. Follow our leader as he directs us in the exercise.
Describe how they felt at the end of the exercise.	How did you feel at the end of the last exercise?

Behavioral Objectives	Focusing Questions
Describe the effects that standing in front of the fan had on them.	How did you feel when you stood in front of the fan?
Note body differences before and after they stood in front of the fan.	What differences were there from when you were exercising?
Give reasons for the differences.	What made your body feel different when you stood in front of the fan?
List words that tell how they felt when they stood in front of the fan.	What words best tell or describe how you felt when you stood in front of the fan? We call these "describing" words.
Relate similar situations when air or wind made their bodies feel cool.	What other times can you tell us about when air or wind made your body feel cool?

Supplementary Learning Experiences

1. Use an extension cord and take the fan outside. Conduct the learning experience outdoors on a fairly calm day and then compare the differences in using the fan inside and outside the building.

Content: Man uses air for recreational purposes.

Materials: One picture of a child utilizing air for recreational purposes (picture of one of the examples listed in lesson), sheets of 9 x 12 white drawing paper, crayons, scissors, construction paper for background of bulletin board.

Learning Experience

Show a picture of a child having fun with some activity involving air. Let children tell what they think is happening in the picture. Ask, "How is air helping this child have fun?" "Can you think of other fun things you do with the help of air?" As children mention specific toys they play with and other types of recreation they have using air, make a master list on the board. Since items will be action-oriented, board listings should be in action terms. (For example: sailing or boating instead of boat or sailboat.) A list of possible responses is given below. If children have trouble giving examples, the teacher can give cues. For example, "I fly it in the air and when I make it I put a tail on it (kite)." Then convert "kite" to the action term "flying kites."

Examples

1. Sailing
2. Blowing whistles
3. Playing instruments (horns, etc.)
4. Flying kites
5. Flying toy airplanes and gliders
6. Playing with boats in water
7. Playing with balloons
8. Making bubbles
9. Throwing frisbees
10. Playing softball, football, etc.

After a list has been developed, each child is to choose which of the forms of recreation would be most enjoyable to him.

Then have each child draw a picture of himself enjoying his first choice activity. Use crayons to color the pictures. Cut around edges of picture to get rid of excess, unused paper. As a class project, develop a bulletin board with their pictures. Let the class make up the title for the display and position people and activities on the bulletin board.

Behavioral Objectives	Focusing Questions
Children will:	
Choose which named activity they would most like to be part of and give reasons for their choices.	Looking at all these ways of having fun by using air, which of them would you enjoy most? Why would you choose that one?
Draw pictures of themselves enjoying that activity.	Draw a picture of yourself doing the activity you chose.
Cut out pictures from the construction paper and develop a bulletin board of fun activities in the air by positioning their cutouts on it.	Let's cut out our pictures and put them together in a whole class picture on the bulletin board.
Propose possible titles for the class picture and state reasons for their titles.	What do you think would be a good title for our picture? Why do you think that's a good title?

Supplementary Learning Experiences

1. Compose cinquains about "Air," brainstorming for lines 2 - 5.
   - 1st line - Title
   - 2nd line - 2 adjectives (What is Air?)
   - 3rd line - 3 verbs (What Does Air Do?)
   - 4th line - 4 adverbs (How Does Air Feel?)
   - 5th line - 1 word synthesizing all of above.

2. Sing the song, "Let's Go Fly a Kite," by Sherman and Sherman (The Magic of Music, Book 3, page 78).

3. Read "The Kite" by Aileen Fisher (In the Woods, In the Meadow, In the Sky, Charles Scribner's Sons, New York, 1965, page 62).

The Kite

What do you see where you ride, kite,
close to the roof of the sky,
higher than swallows glide, kite,
higher than robins fly?
What do you see?

How does it feel when you race, kite,
whisked by a current of air,
wind in your paper face, kite,
wind in your trailing hair?
How does if feel?

Can you see how the river swirls, kite,
glinting its way along,
how the road through the hills uncurls, kite,
thin as a buckskin thong?
Take me along, along, kite,
take me along!

Have children imagine that they are kites flying high in the sky. Let them tell spontaneous stories of what they see as they move through the air.

4. Read the book Let's Find Out What's In the Sky by Martha and Charles Schapp (Watts, New York, 1962). Following the reading, list items that were in the air in the story. Decide if these same items are in the air of your community.

5. Have the children engage in an outdoor recreation period using moving air; e.g., fly kites, blow water bubbles, throw frisbees, shoot paper planes, etc.

Content: Some vehicles of transportation move through the air. Man has continually improved his means of travel by air.

Materials: Globe or world map, opaque projector, pictures or model of Boeing 747 (available from local travel agent), encyclopedia or information book on airplanes.

Learning Experience

Have the class imagine that they are going to take a trip to Japan. Find Japan on the globe or a world map. Focus on physical features between Athens, Georgia, and Japan. Ask, "How might we travel to Japan?" List on the board all the possible means (air; car to coast, then boat; train to coast, then air, etc.). Then explain to the class that in this case they must travel by the fastest means possible. Have them decide which of the listed ways best fits this criteria.

After air travel has been selected, compare traveling by airplane with traveling by land or water. Using the opaque projector and pictures from an encyclopedia or a book on airplanes illustrate several airplanes produced in different periods of time. Then focus on an older model airplane and the Boeing 747. (If possible, check with a local travel agent to see if they have a model Boeing 747 that you could borrow for display purposes.) Have the children compare and contrast the two airplanes. Be sure that children understand that it was the work and ideas of man that brought about these changes.

Conclude by asking, "Could we use airplanes to travel from place to place without air?" If children are unsure of the answer, obtain a child's book on airplanes and how they work to read to the class.

Note: You may wish to have students go through magazines and cut out pictures of means of air travel, bring model airplanes from home, etc. and set up a display area. If enough variety is present, children could attempt grouping airplanes by broad time periods. For example, "Long Ago," "Today," and "Future."

Behavioral Objectives	Focusing Questions
Children will:	
Locate Japan on a globe or a world map.	Pretend that we are going to take a trip to Japan. Find Japan on the globe.
Identify physical features between Athens, Georgia, and Japan.	Look at the globe carefully. What do you see on the globe between Athens and Japan?
Name potential means of travel between two geographic points.	How might we travel to Japan?
Select the fastest means of travel between two geographic points.	Which of these means of travel would be the fastest? Why?
Compare traveling by air with traveling by land or water.	How is traveling by airplane like traveling by water or by land? How is it different?
Observe airplanes representative of different time periods.	Look at these pictures of several airplanes. Notice how they are different.
Note similarities and differences between an older airplane and the Boeing 747.	How are these two airplanes alike? In what ways are these two airplanes different? What brought about the differences?
Make conclusions concerning the necessity of air for the functioning of airplanes.	Would the airplane as a means of transportation be possible without air? Explain your answer.

Supplementary Learning Experiences

1. Do research to find out more about the Boeing 747 and other newer model airplanes; e.g., number of passengers that can be carried, how fast it can travel, etc. Children may wish to make a data retrieval chart comparing and contrasting several airplanes. (Pictures can be obtained from your local travel agent.)

2. Go on a study trip to the local (nearest) airport. If possible, arrange in advance for a pilot to describe to the class how it feels to move rapidly through the air. He could also explain how his airplane works. Children could also observe some of the weather instruments at the airport that are dependent in some way on air or air pressure.

3. From a local travel agency obtain route maps for several different airlines. Study the maps to see where the different airlines fly.

Content: Air supports burning. Burning (fire) can be both helpful and harmful to man.

Materials: Saucer, candle, jar to fit over candle.

Learning Experience

Explain to the children that today the class is going to do an experiment. They are to watch closely to see what happens during the experiment. Light the candle and put it on the saucer. Let the candle burn for a minute and then put the jar over it. After the candle goes out repeat the experiment.

Have the children imagine that there can no longer be burning (fire). What would be the "good" results? "bad" results? Fill in a data retrieval chart like the one illustrated below with childrens' responses.

Ways Fire

Helps Man	Hurts Man

Conclude by reviewing the results of the experiment and the necessity of air to support burning or fire.

Behavioral Objectives	Focusing Questions
Children will:	
Observe an experiment.	Watch closely to see what happens to the candle.

Behavioral Objectives	Focusing Questions
Identify the things they see happening.	What do you see happening? What happened when we put the jar over the candle?
Make statements about causes of the candle going out and give reasons to support their statements.	What caused the candle to go out? Why do you think that was the reason the candle went out?
Hypothesize about what it would be like if there were no "fire."	What are some things that might happen if we had no such thing as fire?
Make statements about "good" and "bad" results of being without fire.	In what ways would we really miss fire? In what ways would we be better off without fire?
Give reasons to support their statements.	Why do you think that we would miss that? Why do you think we would be better off if ...?
Make conclusions concerning the necessity of air for burning or fire.	Would burning or fire be possible without air? Explain what you mean. Then you're saying that if there were no air we would not be able to _____? How do you know?

Supplementary Learning Experiences

1. Discuss some school fire regulations. Ask in what way some of these have to do with air supporting burning; e.g., keeping doors closed, etc.

2. Ask the children to consider how they would put out a fire. Explain the meaning of "smothering" a fire.

3. Tell the class a modified version of the Greek myth about Prometheus.

Content: Man harnesses (uses) the power of air for useful purposes.
Materials: None

Learning Experience

Begin by referring back to the activity in which children stood in front of a fan after exercising. Ask if anyone has felt cooler by a breeze or the wind blowing on him. Compare and contrast the two methods of cooling. Point out how one method is natural while the other is a way that man has invented to use air for a purpose. Make a listing on the chalkboard of several other uses or "supports" of air. Decide if each is natural or man-invented by putting it in the appropriate column of the chart.

Uses of Air

Natural	Invented by Man

Have the children think about their home and their classroom to see if they can identify some other ways man has invented to make use of air. (Examples: heat, air conditioners, drying clothes, drying dishes, etc.) The children may need to be given cues to identify examples.

Behavioral Objectives	Focusing Questions
Children will:	
Recall a previous activity.	Remember the day we exercised and you stood in front of the fan? How did your body change?

Behavioral Objectives	Focusing Questions
Compare and contrast two ways of cooling the body.	Has the same thing happened when you stood in a breeze or in the wind when you were hot? How are the two ways of cooling alike? How are the two ways of cooling different?
Group uses of air as natural or invented by man.	Is this a natural use of air or has man invented this way of using air?
Recall other things that man has invented to use air.	What are some other things that man has made to use air?

Supplementary Learning Experiences

1. Ask children if any have ever seen a windmill. Show pictures of some. Use construction paper or empty oatmeal cartons to make windmills. Explain how these were used to produce power.

2. Have the children try jumping from a standing position, then walking, then running. Which way helps you make the longest jump? Explain how air provides "lift."

3. Explain to the children that even modern airplanes with powerful engines make use of wind patterns. That is one reason why they need directions from the control tower.

Content: Although air supports life in many ways, air can be harmful to man.
Materials: Pictures of windstorms, hurricanes, tornadoes, Time of Wonder by Robert McCloskey (Viking Press, New York, 1957).

Learning Experience

Begin by reviewing with children some of the ways that air helps man. Then show some pictures depicting windstorms, hurricanes, tornadoes, etc. See if children know what causes these storms. If not, explain causes. The teacher may have to elaborate on this (causes) as many six year olds may not have yet learned the concept of causation. Then ask if air is always helpful to man.

Read the book Time of Wonder by Robert McCloskey to the class. Before beginning reading, direct children to listen for ways that moving air (wind) causes danger. Following the story, focus discussion on the storm and how it affected the actions of the people in the story.

Ask children if they can think of other things that moving air (or wind) can do that harms or upsets people. Those with ideas might act out the ideas with the rest of the class attempting to guess what the moving air (wind) has done or is doing.

Behavioral Objectives	Focusing Questions
Children will:	
Recall ways air helps man.	How does air help man?
Observe and describe pictures of storms, etc.	What are some things you see happening in this picture?
Hypothesize about the causes of these storms.	What do you think is causing that to happen? What do you think may have made this storm happen?
Consider effects of air in storms.	Is air always a help? When is it not a help?

Behavioral Objectives	Focusing Questions
Listen to the story, focusing particularly on the damage caused by wind.	As you listen to the story, try to notice the ways wind causes damage.
List the things they remember about the storm from the story.	What are some of the things you heard in the story about the storm? What are some things that happened to people because of the storm?
Suggest other times when wind can harm or upset people and act out such situations.	What other times can you think of when wind causes trouble for people? Act out such a time.
Identify situations being acted out.	Let's try to guess from the acting what it is that is happening.

Supplementary Learning Experiences

1. Make a cloud by putting a few drops of concentrated hydrochloric acid on one dish and a few drops of concentrated ammonia on another dish. Place the two dishes side by side. When gaseous vapors unite in the air a white ammonium chloride cloud will form.

2. Make smog by dropping a burning match into a half gallon bottle. Let smoke form in the bottle and then blow hard into the bottle. Release quickly. Smog is produced by the combination of water vapor (from your breath) and smoke. Point out that in this case it is not necessarily the air that is harmful but that the particles in the air (smog) can cause illness.

3. Obtain a copy of Storms: Their Origins and Effects; Forecasting; Weather Lore by Paul E. Lehr (Golden Press, New York, 1966). Select sections that are appropriate for your children. Storms described include rain and snow storms, windstorms, thunderstorms, tornadoes, and hurricanes. The book contains rich selections of pictures of storms and their results.

Content: Air helps man; man can help the air.
Materials: Experience chart paper, magic marker.

Learning Experience

Record a class experience story about how air helps man on a large sheet of chart paper. Once the story is completed, read through it with the class. Then ask the class if there is any "action" or "the air doing things" in the story. Let children choose parts of the story they would like to act out. Read the story again, this time with children acting out the action parts. (If children are interested, you may wish to read the story more than once with different children acting out different things each time. If possible, let children read their story.)

Conclude by pointing out that air helps man in many different ways. Ask, "Are there any ways that man could help air?" Display the experience chart where other classes can see it. Some children may wish to draw pictures illustrating some part of the story. The class might also wish to make arrangements for putting on their acting story for other classrooms.

Behavioral Objectives	Focusing Questions
Children will:	
Compose an experience story that will include several ways that air helps man.	Today we are going to make a story about how air helps man. Think about all the things we have been studying and see if you can tell us something to go in our story.
Act out various parts of their story.	Which parts of the story tell about some action, "about the air doing something?" How could you act that out?
Name ways that man can help the air.	If air helps man in so many different ways, can you think of how man might help the air? Let's name as many ways as we can think of.

Supplementary Learning Experiences

1. Have children figure out the answer to this riddle:

   Sometimes it is full or rain,
   Sometimes it is full of snow,
   Sometimes it is moving
   And makes this sailboat go.
   It's most important for people
   For plants and animals, too.
   It's right here in our schoolroom,
   And all around you.
   What is it? (Air)

   Taken from People and Their Environment: Curriculum Guide for Grades 1-2-3, (J. G. Ferguson Publishing Company, Chicago, 1968, page 119). Suggest that children make up riddles concerning air and what it can do.

2. Read Earth and Sky by Mona Dayton (Harper, New York, 1969). This book contains a large variety of vivid, colorful illustrations useful for developing receiving, responding, and valuing levels of the affective domain.

Level Two: Seven Year Olds
Theme C: Man and Air

INSTRUCTIONAL MODULE 2C

AIR POLLUTION - A THREAT TO MANKIND

MODULE GENERALIZATION: Man and his activities are responsible for polluting the air.

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1973

Preface

The purpose of the Primary Environmental Education Project of the University of Georgia was to develop and field test nine instructional modules designed as supplementary material for a primary level social studies program. The modules focus on teaching/learning activities that will build an understanding of the interrelationships between man and the land, water, and air. In the construction of the modules primary emphasis was given to the thinking processes of young children and the provision for many opportunities to engage in creative thinking.

Project personnel are: Everett T. Keach, Jr., and Elmer D. Williams, Co-Directors; Cheryle Johnson and Ann McCarthy, Research Associates; Marie Banks, Faye Jenkins, Carole May and Vickie Spence, Clarke County Public Schools, Project Associates; Agnes Amos, Dycie Campbell, Judy Carter, Aurelia Fraley, Evelyn Griffin, Thelma Hurley, Margaret James, Dorothy Keach, Faye McKinney, Virginia Rogers, and Marty Shirley, Project Teachers, Clarke County Public Schools; Elizabeth Acheson, Frank Golley, E. Paul Torrance, and William Zeitler, University of Georgia, Project Consultants.

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Cover design by Sherri Hardeman, a primary level pupil at Oconee Street Elementary School, Athens, Georgia.

REQUIRED MATERIALS

Throughout this module a variety of materials and/or arrangements will be required. Some of these may take some time to secure. Provided below is a sequential listing of the needed materials.

1. Stop watch, if possible

2. Magazines displaying pictures of air pollution, experience chart paper, drawing paper

3. Butcher paper

4. Tank vacuum cleaner, filter paper, rubber band

5. Film projector or flashlight, chart paper

6. Cars in teachers' parking lot, white cards 5" x 5", vaseline, magic markers

7. White saucer, candle, matches, white newsprint, black and white paint, scissors, paste, felt tip pen, cardboard, sample Ringelmann Smoke Chart - these can be obtained from the Philbrico Company, 1800 Kingsburn Street, Chicago, Ill., 60614

8. Spray perfume, ammonia, hair spray

9. Overhead projector, outdoor scene on transparency, 2 Zip-a-tone transparency sheets (light gray sheet and dark gray sheet), camera light meter

10. Shoe boxes with lids, transparency sheet - 1 sheet per group, 1 black tube of acrylic paint, razor blade, construction paper, paste

11. Large cardboard box, two white sheets of construction paper.

12. Who Will Clean the Air by Thomas Biddle Perera and Wallace Orlowsky (Coward, New York, 1971)

13. Newsprint, crayons, dittos

Level Two: Seven Year Olds
Theme C: Man and Air
MODULE GENERALIZATION: Man and his activities are responsible for polluting the air.

Content: Air is needed for human life.
Materials: Stop watch, if possible.

Learning Experience

Use a stop watch and ask the children to count how many times they breathe in one minute. Have each child tell how many breaths he took in one minute. Have them listen carefully to each child's response. List the responses on the board and then compute the average number of breaths per child. Ask them what they are doing when they are breathing. Bring in the fact that they breathe in air.

Have the children sit quietly for one minute. Discuss what would happen if there was no air and the importance of air to our lives.

Behavioral Objectives	Focusing Questions
Children will:	
Count the number of intakes during one minute.	Count how many breaths you take in one minute to yourself. Count one breath for each time you breathe in. We'll use a stop watch to time one minute.
Note the approximate number of breaths a class member takes in one minute.	Listen very carefully for each child is going to tell us how many breaths he took in one minute. Listen to find out the number of breaths most of our class members took. Then we will figure the average number of breaths taken in one minute.

Behavioral Objectives	Focusing Questions
Explain what they do when they breathe.	When I asked you to breathe, what exactly did you do? What did you need to do when you took your breath?
State conclusions about air.	What does this tell us about air?
Hypothesize the results if there were no air to breathe.	Now let's sit quietly for one minute and just breathe naturally. (Wait one minute.) If there had been no air in our classroom during the last one minute, what do you think would have happened to us?
State the importance of air.	What does this tell us about the importance of air?

Supplementary Learning Experiences

1. Secure a life size dummy, Resusi-Annie, to demonstrate how the lungs expand and contract when breathing. You can explain that when people drown, their lungs fill up with water and air cannot get in to the lungs until they are emptied of the water. Discuss the role of artificial respiration. The Resusi-Annie can be secured from Athens General Hospital by contacting Miss Shelby Lary in Staff Development.

2. Discuss why some people are given oxygen in the hospital when they are having difficulty with their breathing. State that oxygen is one of the major elements in air.

3. Explain the difference between inhaling and exhaling. Find out what is in the air when it is inhaled and exhaled.

Content: People can pollute the air they breathe.
Materials: Magazines that will contain pictures of air pollution, experience chart paper, drawing paper.

Learning Experience

Have the children list all the ways people, including themselves, pollute the air. List these in experience chart form to be used later as a reference in the construction of the bulletin board. Then have the children find pictures of air pollution in the magazines. The teacher should bring in some pictures as examples. With these pictures have the children construct a bulletin board. With each picture have the children circle the source of air pollution if it is shown in the pictures. If the children cannot find a picture depicting a cause from the experience chart, have them draw one. Throughout the module if the students find additional causes of air pollution, add them to the chart and bulletin board.

Behavioral Objectives	Focusing Questions
Children will:	
List the ways people pollute the air.	How many ways do we pollute the air in the classroom? What are some of the ways people, including ourselves, pollute the air outside the classroom?
Locate pictures of air pollution in magazines.	Go through these magazines and see if you can find any pictures showing air pollution.
Circle sources of pollution in pictures containing examples of air pollution.	Let's circle the sources of the air pollution in the pictures we have collected.
Draw pictures to illustrate causes of air pollution.	We do not have an illustration of that way of polluting the air. How would you show that in a picture?

Supplementary Learning Experiences

1. How does your family pollute the air during the week-end? Have the children bring in their lists and compare them with each other.

2. Consider how air pollution affects our clothes, our home, our body, etc.

3. Have children describe how air pollution could cost their parents money.

4. Write sentences to explain what is happening in the pictures of air pollution attached to the bulletin board. Attach sentence descriptions near their corresponding pictures.

5. Ask parents to identify some sources or causes of air pollution in Athens.

BEST COPY AVAILABLE

Content: The air pollution index indicates the amount of air pollution in the air. Weather can affect the amount of air pollution in the air.

Materials: Butcher paper.

Learning Experience

Prior to this lesson make a large calendar for the period of time you will be working on this module. Divide each day with a diagonal line.

Begin the lesson by discussing the air pollution index with the children. Explain that it tells us how clean the air is every day in Atlanta. Athens does not have enough air pollution to require an air pollution index (API). When the API is at 100, then people who have health problems connected with breathing must be careful not to be outside too long. Tell the children they are going to keep a daily record of the API in Atlanta. The API will go into the top part of each box. In the bottom half they will put the weather - sunny, cloudy, rainy, snowy. Have at least three people each day watch the weather report at night and bring the results to school the next morning. If the class is in the room during the noon forecast, you may wish to watch the forecast in the classroom via T. V. Complete this activity prior to the last learning experience of the module. Have the children name the dates on which we had the least pollution. List these dates on the board. After the data, write the type of weather we had on those dates. Have them speculate as to why they think this type of weather brings about a low API reading. Have the children list the dates and the type of weather when there was a high API reading. Have them speculate as to why they think this type of weather brings about a high API reading.

Behavioral Objectives	Focusing Questions
Children will:	
Discuss the use of the air pollution index.	How many children have heard a weather forecaster talk about the air pollution

Behavioral Objectives	Focusing Questions
	index? What do you think the air pollution index tells us about the air? (If they do not know, explain the use of the API.) When the API is 100, our air is so polluted from cars, smoke stacks, etc., that many people have difficulty breathing, particularly those who normally have problems with breathing. (Hay fever, lung problems.)
Hypothesize why Athens does not have an API.	Athens does not have an Air Pollution Index. Why do you suppose we do not have one?
Record API and weather.	We are going to keep track of the air pollution index in Atlanta and record it on our calendar. We are also going to keep track of the weather every day to see if it has any effect on the amount of pollution in our air.
List the dates and the type of weather when there is the least pollution.	What dates did we have the least pollution? What type of weather did we have on these dates?
Determine the type of weather which seems to bring about a low API and give reasons why they think this happens.	What type of weather seems to bring about low air pollution? (Rainy) Why do you think this type of weather brings about low API?
Determine the type of weather that seems to bring about high API readings and give reasons why they think this happens.	On what dates did we have the most air pollution? What type of weather seems to bring about high amounts of air pollution? (Cloudy) Why do you think this type of weather brings about a high API reading? (Holds pollution in.)

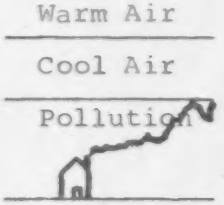
Supplementary Learning Experiences

1. What health problems can you think of that may be caused due to pollution in the air? These problems may be related to our breathing: asthma, sore eyes, etc.

2. What season do you think would have the highest API reading for the entire season. What days of the season do you think would tend to have the highest API reading?

3. Make a line graph showing the various daily levels of the API readings simultaneously with the daily filling in of the API-weather calendar.

4. Explain to the children what temperature inversion is. Inversion is when very warm air stays over the city. This traps cool air under it. Since the cool air can't move there can be no wind. The smoke and pollution remains hanging over the city, thus creating a high API reading.



Content: Solid particles are found in the air.
Materials: Tank vacuum cleaner (one that utilizes a hose), filter paper, rubber band.

Learning Experience

Run a tank vacuum cleaner for a while to clear all the dirt out of it. Cut a piece of filter paper a little larger than the end of the hose of the vacuum cleaner and place it over the hose. Use a rubber band to hold it in place. At a convenient time during the day, leave the cleaner on for 20-30 minutes in the classroom. Make sure the hose is not resting on the ground. Also leave it on for an equal period of time at two different locations outside. Place the three filters on a bulletin board and allow the children to observe them. List below each filter the kind, shape, and size of the particles found on the filter paper. Compare the amount of solid particles on each filter. Discuss possible sources of particles.

Behavioral Objectives	Focusing Questions
Children will:	
Construct the pollutant collector.	
Observe and describe the particles found on the filter paper.	What things do you see on each filter?
Hypothesize concerning the source of the particles of dirt.	What is the source of each of the solid particles found on the filter? How did these particles get on our filter?
Compare and contrast the solid particles found on each filter.	Do we find the same type of particles on the filters from the outside as we find on the filters from the classroom? How are they the same? How are they different? Why do you suppose they

Behavioral Objectives	Focusing Questions
	are different? the same? Which filter contains the greatest amount of solid particles? the least? Why do you think this is the case?
Discuss the effects of these solid particles in the air.	Do you think we breathe in these solid particles while in the classroom? What effect might (the chalk dust) have on our breathing? What effect might the dirt in the air outside have on our breathing?

Supplementary Learning Experiences

1. Using a magnifying glass have the children count the number of particles in an ½ inch square sector of each filter from this module activity. (It may be impossible to count all of them. Let children come to this conclusion.) Mark the square on the filter paper before you do the experiment in the module.

2. Place a piece of cheese cloth over a window. Keep it there for one day. Observe the cheese cloth at the end of the day. How is it different now from when it was first placed over the window?

3. What is pollen? Have the students find this answer through research if they don't already know. Discuss how pollen in the air affects our health.

4. Compose a class story about the particles they have collected out of the air and how those particles might affect man's health.

Content: Dust is a pollutant.
Materials: Film projector or flashlight, chart paper.

Learning Experience

Darken the room and turn on the light of the film projector. Have the children tell what they see in the light beam. Focus the light on the chalkboard, then erase the chalkboard. Again have the children observe the particles in the light beam. Point out that the dust in the air is a pollutant. Have the children observe after school the various things that cause dust. List responses on an experience chart.

Behavioral Objectives	Focusing Questions
Children will:	
Observe the air in the dark room before chalk dust has been added to the air.	What do you see in the air?
Observe chalk dust in the air and explain how it got there.	(Turn on the film projector.) Now what do you see in the air? When we erase the chalkboard what happens to the air in the classroom?
List various things that cause dust and explain how some activities cause dust to enter the air.	On the way home look around you. Do you see anything that causes dust to enter the air we breathe? Look around your house. Do you or your family cause dust to enter the air? How?

Supplementary Learning Experiences

1. Clean a piece of glass or wood so that there is no dust on the surface. Come back an hour later and note any differences.

2. Show children a picture of a car moving down a dirt road in the summer time. Compare it to a picture of a car riding down a paved road in the summer time. Discuss why we pave our roads.

3. Discuss how in the Plains area of the Midwest the wind can cause a dust storm. Incorporate into the discussion the blinding affect of the storm and how many people get lost in the storm. Locate this area, "the Dust Bowl," on the map and speculate as to why there are dust storms in this area.

4. Recall from experience pollutants (particles) that have been caught in your eyes. Describe the feelings you had on such occasions.

Content: Exhaust gases of cars cause air pollution.
Materials: Cars in the teachers' parking lot, white cards 5" x 5" (as thick as index cards), vaseline, magic marker.

Learning Experience

Discuss with the children how cars pollute the air. Tell the children they are going to see how much pollution is exhausted by their teachers' cars. Take a 5" x 5" card and label the back of the card with the teacher's name, make, model, year, and type of gas used in each car. Then smear the opposite side of the card with a thin layer of vaseline and have a child hold it a few inches away from the exhaust pipe. Have the teachers start their cars. Be sure to have the child stand at the side of the automobile so that he doesn't breathe in any carbon monoxide. Group the white cards in rows from very light to very dark and have the class compare them. Discuss why some cars emit more pollutants than others.

Behavioral Objectives	Focusing Questions
Children will:	
Discuss how cars pollute the air.	How do you think cars pollute the air?
Label cards with the make, model, and type of gas of the various cars tested.	Today we are going to see how much pollution is exhausted by the teachers' cars. Take a white card and list the teacher's name, the make, model, year and type of gas used in the car.
Collect 5" x 5" vaselined cards of exhaust pollutants.	How could we use these cards to collect pollutants from the cars?
Arrange the cards from lightest to darkest.	Which card is the darkest? What does this tell us about the amount of

Behavioral Objectives	Focusing Questions
	pollution the car is exhausting? Why do you think some cars give off more pollution than others (old car, type of gas)?
Categorize pollutants as visible or invisible.	Are the pollutants on these cards visible or invisible?

Supplementary Learning Experiences

1. Have the children formulate solutions for decreasing car exhaust.

2. Discuss the advantages and disadvantages of the different modes of transportation we use in regards to air pollution: car, foot, bike, train, bus, airplane, etc.

3. Have a car dealer come to speak to the children about the pollution control devices that have been put in newer cars. Ask, "Why don't older cars have these pollution control devices?"

Content: The smoke from burning waste causes air pollution.
Materials: White saucer, candle, matches, white newsprint, black and white paint, scissors, paste, felt tip pen, cardboard, sample Ringelmann Smoke Chart.

Learning Experience

Hold a cold white saucer over a burning candle. Tell the children to imagine that the candle is fuel burning in a factory. Allow the children to look at the soot residue on the plate. Discuss the effects smoke has upon the plate.

Have the children list on an experience chart the various ways they have noticed Athens' people causing smoke to fill the air: burning leaves, car exhaust, smoke stacks, etc. Show the children the Ringelmann Smoke Chart and discuss its use. It shows how dense or polluted the smoke is. Describe how to use the Ringelmann Smoke Chart. Hold the chart at arm's length. Look through the hole. Pick the shade that comes closest to the color of the smoke. It is better to take more than one reading to validate the results. It is necessary to be no less than 100 feet nor more than ¼ mile away from the source of smoke. Tell the children they are going to make their own smoke chart. Have them tell you what colors are present on the sample smoke chart and ask them how they can mix paints to match the shades of gray on the chart. Aid the children in mixing a batch of paint closely matching the color on the sample card. Mimeograph a blank pattern of the smoke chart for each child to paint in. Paint the chart and when dry, paste it on a a piece of cardboard. Cut out the center hole. Print in the % density near each color.

Have the children make readings of various locations of smoke listed previously in the lesson and then report their findings to the class. Write the results on the experience chart. Discuss then the effects the smoke has on the air.

Note: Ringelmann Smoke Chart from Philbrico Company, 1800 Kingsburn Street, Chicago, Ill. 60614.

Behavioral Objectives	Focusing Questions
Children will:	
Observe the results of burning fuel.	Let's pretend that the lighted candle is fuel burning in a factory. What happened to the fuel that we watched burn? (Show them the plate.)
State conclusions about the cleanness of the air.	If there were many factories in a town and they were all filling the air with smoke, what would this tell us about the cleanness of the air?
List the various ways people cause smoke to fill the air.	Where have you noticed smoke filling the air in Athens?
Hypothesize concerning which section on the chart indicates the least pollution and give reasons for their responses.	Which section on the wheel do you think indicates the least pollution? What makes you say this?
Use the Smoke Chart with the teacher's instructions.	Let's use the Smoke Chart to find the amount of pollution from this smoke.
Validate their results by taking two readings.	Why do you suppose we should take more than one reading?
Explain how to make different shades of gray.	What colors do you see on this smoke chart? How would you mix paint so that the paint color will match the color on the smoke chart?
Match the color of the smoke to the color on their smoke chart.	Let's look at our list of ways people cause smoke to enter the air. Pick one of these around your home. Match the color of the smoke to a color on your chart. (It might be wise to assign

Behavioral Objectives	Focusing Questions
	one source of smoke to several children so they can compare their results.)
State conclusions about the cleanness of the air.	Was the smoke we found around Athens very dark? Is the air around Athens very polluted? (It shouldn't be very polluted.)

Supplementary Learning Experiences

1. Develop the concept of the five senses: taste, touch, smell, hear, see. Burn a piece of paper under a coffee can with a couple of holes in the top. After the paper has been burned have the children discuss how the burning of items negatively affects each of the five senses. Burn other items and describe sensory impressions.

2. Relate this activity to their discussion of the city dump and the land-fill. Discuss the advantages of the land-fill in relation to smoke.

3. Have they ever seen places where they saw a "No Smoking" sign? If so, when? Discuss why there would be some places where people were allowed to smoke and other places where they weren't allowed to smoke.

Content: Some pollutants are invisible.
Materials: Spray perfume, ammonia, hair spray.

Learning Experience

Explain to the children that they are going to use their noses today. Have them close their eyes and spray perfume into the air. Have them open their eyes and tell them to raise their hand when they smell something. When most everyone can smell the perfume, ask them what they smelled. Do this same activity for the ammonia and hair spray. Discuss why some children didn't smell the odor as soon as others.

Behavioral Objectives	Focusing Questions
Children will:	
Smell various odors.	Today we are going to use our noses. Close your eyes. (Spray the perfume.) Now raise your hand when you smell something.
Name odors they smell.	What do you think you smelled? From where do you think the odor came?
Explain why some people didn't smell the odor as soon as others.	Why did some of you smell the odor sooner than others? (Repeat this procedure for each of the odors.)

Supplementary Learning Experiences

1. Have the children list all the different odors they smell in the air. Classify them into two groups: "negative" odors and the "positive" odors.

2. Let children discuss the following questions: Which air pollutants are the most dangerous, the ones we can see or the ones we can't see? Why?

Supplementary Learning Experiences

3. There are some sources of pollution that contain both visible and invisible pollutants; e.g., car exhaust. Review the experience when children collected pollutants in teachers' car exhaust. Ask, "Which do you think would be more dangerous to your health, the invisible or the visible pollutants?"

4. Decide whether the odor of some of the pollutants (those listed in the above lesson) spread through the room quicker than others. If so, discuss why some smells can be detected sooner than others.

Content: Air pollution blocks the sunlight and lessens visibility.
Materials: Overhead projector, picture of an outdoor scene (depicting clean, fresh air), two sheets of Zip-a-tone transparency paper of two shades of gray (light and dark), camera light meter.

Learning Experience

Set up an overhead projector with the picture of the outdoor scene shining on the screen. Tell the children to pretend that the light coming through the picture is sunlight. Explain and demonstrate the use of a camera light meter. Using the light meter, determine the amount of light that is shining on the picture by holding the light meter up to the screen and record this value on the chalkboard. Ask the children what kind of a day it is and how clean they think the air is. Place a light gray zip-a-tone transparency over the picture. Have the children measure the amount of light shining on the picture now.

Take away the light gray transparency and replace it with the dark gray transparency. Again record the amount of light shining on the picture and discuss the changes that have taken place.

Behavioral Objectives	Focusing Questions
Children will:	
Pretend that the light shining on the screen is sunlight.	Here is a picture of an outdoor scene. Let's pretend the light shining on the screen is sunlight.
Describe the type of day it is depicted in the picture.	What kind of a day is it today? How clean do you think the air is?
Use a camera light meter to measure the amount of sunlight in the picture.	When taking a picture with a camera, one needs to know how much sunlight there is surrounding the picture one wishes to take. One uses a light meter to determine the amount of sunlight.

Behavioral Objectives	Focusing Questions
	Let's see how much sunlight there is in this scene. (Record the results.)
Compare the outdoor scene before and after air pollution.	Imagine that there is a factory located very near this place and that it gives off a lot of smoke. (Place light gray transparency over picture.) How has the smoke changed the scene? Is there as much sunlight? What things make you say that?
Measure the amount of sunlight in the scene after pollution (light gray transparency) has been added.	Let's see what our light meter shows us concerning the amount of sunlight shining on the outdoor scene now. (Record.)
Describe the visibility in the outdoor scene.	How else has our outdoor scene changed? Can we see the items in the picture as well as we did on the sunny day? What things in the picture make you say this? (Take away the light gray transparency and replace it with the dark gray transparency.)
Describe the changes brought about by a greater amount of air pollution and compare the two views of the polluted site.	Today the factory has been producing a lot more products and it is giving off more smoke than usual. How has the outdoor scene changed today? (Use the same questions as when the light gray transparency was added.)
	Which was the more polluted view? Why?

Supplementary Learning Experiences

1. Discuss with the children why decreased visibility causes more car accidents. Why would this be a major cause of traffic accidents in the city rather than in the country?

2. Explain how visibility is made from the word vision. Discuss the meaning of vision and then the meaning of visibility. Show how other substances can cut down on visibility. Dip one half of a piece of glass in soapy water and compare the visibility of the two halves of glass. You can also use hair spray for this activity.

3. Recall times when traveling with parents that visibility has been poor. Describe the weather at those times.

Content: Air pollution blocks sunlight and visibility.
Materials: Shoe boxes with lids, transparency paper (one of each for every five children), one tube of black acrylic paint, razor blade, construction paper, paste, old newspapers.

Learning Experience

Have the children bring in shoe boxes. Explain what a diorama is and tell them they are going to build a diorama of some outdoor scene: either their yard, schoolyard, or campsite, etc. Divide them into groups of approximately five each. Give each group one shoe box and one piece of transparency paper. Have the children decide in their groups the scene they will develop. They should make a rough sketch so that what they are doing will be clear to all the groups. As you give directions to the children, demonstrate by constructing a diorama for them to see. Direct them to place the uncovered box lengthwise in front of them. On one inside length of the box, tell them to color in the sky and the sun (See Diagram 1). Then they should cut out of construction paper the objects they intend to include in their scene (trees, flowers, animals, etc.). Each object should have a tab on the bottom so it can be secured to the box (see Diagram 1).

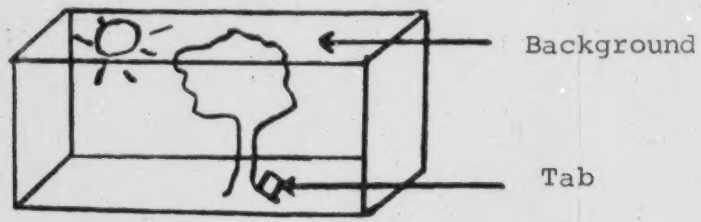


Diagram 1

The tab will be bent back and glued to the bottom of the box. If the objects tend to fall down, glue a small strip of paper on the back of the object and secure the other end to the bottom of the box. While three of the children are making objects for the diorama, have the other children in each group spread a thin coat of black acrylic paint across the top of the transparency. Before painting, have the children spread out the newspaper to work on. A piece of cardboard can be used to spread the paint

Learning Experience

across the plastic. The coat should be thin enough to read print through it. (Acrylic paint will wash out of clothing if cleaned immediately.) Place the lid on the box and cut a slit two or three inches long and 1/8 inch wide near the front of the lid (see Diagram 2). Also, cut a hole at the back of the lid the length of the box approximately 2" wide (see Diagram 2). Cut a peep hole (2" x 2") in the middle on the long side of the box opposite the picture (See Diagram 3). This peephole should be in line with the slit cut in the front of the lid. (The teacher should be responsible for the cutting of the boxes.) Place the boxes close to the window where there will be a lot of light. Have the children observe the scenes in their boxes.

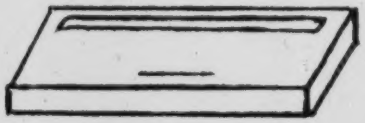


Diagram 2

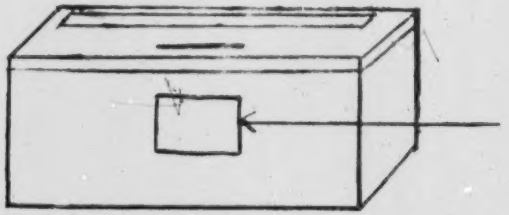


Diagram 3

After the transparencies have dried, cut three 2" or 3" x 7" strips. Slide one of the transparencies through the front slit in the lid. Have the children observe the changes in their scenes. One at a time add the other transparency slides in the slit and observe the changes in the scene.

Behavioral Objectives

Children will:

Construct the diorama.

Focusing Questions

Today we are going to make a diorama. Our dioramas will be three-dimensional pictures built in boxes. We are going to create some outdoor scenes in our boxes.

Behavioral Objectives	- Focusing Questions
Describe the weather in their diorama.	What type of day is shown in your diorama?
Identify changes caused by air pollution.	Our transparencies represent pollution. Let's slide one of our sheets of plastic through the slit in the lid. What changes have occurred in the box? (Add the rest of the transparencies and have the children observe the changes.)

Supplementary Learning Experiences

1. Have the children make a set of eye glasses with gray transparency lenses. Have the children wear their glasses outside and observe the changes in their environment. They can cut the glasses out of cardboard and paste on the plastic lenses.

2. Draw a picture of the results of air pollution in regard to decreased visibility.

Content: Water cleans the air.
Materials: Large cardboard box, two sheets of white construction paper.

Learning Experience

This activity requires timing. Just prior to an imminent thunderstorm place outside a large cardboard box having low sides and with a sheet of construction paper covering the bottom of the box. After the first minute to two of the rain, have a child put on a raincoat and bring the box back to the classroom. (Otherwise a very heavy rainfall might even wash away dirt particles.) Observe the particles on the paper and discuss where these particles came from. Take out the sheet of white paper and save it. After the storm (or another day) again put a sheet of white paper over the bottom of the box and place the box in the same location as before. Allow the box to sit outside for about two hours. Observe the particles collected on the bottom of the box. Compare the differing amounts of particles.

Behavioral Objectives	Focusing Questions
Children will:	
Hypothesize about the changes that might take place on a sheet of white paper as a result of rain falling on the paper.	What do you think will happen to the white paper if we set this box outside in the rain for two hours?
Identify changes in the paper.	(After rainfall.) What do you now see on the white paper? What happened to the paper as a result of the rain falling on it?
Identify possible sources of the dirt particles.	Where do you think these bits of dirt came from? How did they get on the paper?
Hypothesize about the amount of particles they will find on the paper that was placed outside on a non-rainy day.	Do you think we will have more or less bits of dirt on the paper than we had on the paper on which rain fell? Why?

Behavioral Objectives	Focusing Questions
Make statements of comparison and support those statements.	In what ways are the two sheets of paper alike? What makes you say this? In what way are the two sheets of paper different? What makes you say that?
Draw conclusions concerning the effect of rainfall on the amount of pollution in the area.	What does this tell you about the effect of falling rain on the pollution?

Supplementary Learning Experiences

1. Before a rainstorm place a clean jar outside. After the rain have the children observe the film of dirt on top of the water.

Content: Water cleans the air.
Materials: Who Will Clean the Air by Thomas Biddle Perera and Wallace Orlowsky, (Coward, New York, 1971).

Learning Experience

If you were unable to complete the previous experience dealing with the way water cleans the air, read this book to the children, Who Will Clean the Air. Focus particularly on the content found on pages 26-31. Discuss the way the rain cleaned the air in the story. Discuss what could have happened if the boy had carried out his experiment before the rainstorm.

Note: Even if your class completed the previous experience, this activity can be used to reinforce the stated content.

Behavioral Objectives	Focusing Questions
Children will:	
Enumerate the things they remember from the story.	What do you remember from the story you just heard?
Make statements about why the air seemed cleaner after the rain.	Nan and Tony felt the air was cleaner after the rainstorm. What may have caused that? How would that happen?
Hypothesize what would have happened had Tony carried out this experiment before the rainstorm.	What do you think would have happened had Tony carried out this experiment before the rainstorm?
Draw conclusions concerning the effect on rainfall on the amount of pollution in the air.	What does this tell you about an effect of rain on the air?

Content: There are many different attitudes toward air pollution.
Materials: Newsprint, crayons, dittos, a few cartoons.

Learning Experience

Most children will probably be familiar with cartoons. This is an opportunity to introduce it as an art form. Distribute the sample cartoons to the class and let them read and enjoy them together. Discuss with them some of the characteristics of a cartoon. Focus on the illustrations being overdrawn and the little use of words.

Tell the children they will now write cartoons expressing their feelings about air pollution through the characters in their cartoon strip. The cartoon strip should contain between four and six scenes. Divide the children into groups and have them work together to develop a cartoon based upon one of the themes suggested on the next page or a theme of their own choosing. Encourage the children to use dictionaries to check the spelling of their words. After the completion of the cartoons, have the children copy them onto dittos, duplicate the dittos, and arrange the cartoons in booklets. Design covers for the booklets.

Behavioral Objectives	Focusing Questions
Children will:	
Identify characteristics of a cartoon.	What are some things that you noticed about these cartoons?
Express their feelings toward air pollution through cartoon strips.	Today we are going to be cartoon strip writers. Our cartoons are going to deal with the things we've learned about air pollution. I am going to give each group an idea on which to base a cartoon. (If you wish, you may use an idea of your own in the cartoon.)

Behavioral Objectives	Focusing Questions
Make a booklet containing their cartoons and distribute them about the school.	Cartoons are found in newspapers so that many people can share in the thoughts of the cartoon writers. If you were going to share your cartoons with others, how might you go about making it possible for many other people to read and enjoy your ideas?

Possible Cartoon Themes

1. Two cars discussing the air pollution caused by car exhaust.

2. Two trees that are growing near a factory that gives off a lot of smoke, discussing their difficulty in breathing.

3. A rabbit and a chipmunk that live in a family's backyard where leaves are burned regularly. Discuss their attitudes toward the air pollution.

4. Two mosquitoes sitting on the top of the chalkbaord in a classroom express their feelings toward air pollution.

5. Two cows grazing in the pasture. There is a great amount of pollution in the air. Discuss their feelings toward the pollution as they search their way for the barn.

6. A family of raindrops falling through the air. Discuss their experiences as they fall through the air.

7. Tell the conversation between a flower and a butterfly when the air pollution index reads 100.

Supplementary Learning Experiences

1. Construct mobiles illustrating different causes of air pollution.

2. Have children role play the theme for their cartoon.

3. Contact the local newspaper and find out whether newspaper officials have any interest in printing some of the cartoons.

Level Three: Eight Year Olds
Theme C: Man and Air

INSTRUCTIONAL MODULE 3C

PROTECTING OUR AIR RESOURCES

MODULE GENERALIZATION: Man can reduce the danger of pollution of his air resources by several methods.

These materials were developed by the Primary Environmental Education Project of the University of Georgia under a grant from the U. S. Office of Education (Project No. OEG-0-72-5121). All publication rights reserved.

1973

Preface

The purpose of the Primary Environmental Education Project of the University of Georgia was to develop and field test nine instructional modules designed as supplementary material for a primary level social studies program. The modules focus on teaching/learning activities that will build an understanding of the interrelationships between man and the land, water, and air. In the construction of the modules primary emphasis was given to the thinking processes of young children and the provision for many opportunities to engage in creative thinking.

Project personnel are: Everett T. Keach, Jr., and Elmer D. Williams, Co-Directors; Cheryle Johnson and Ann McCarthy, Research Associates; Marie Banks, Faye Jenkins, Carole May, and Vickie Spence, Clarke County Public Schools, Project Associates; Agnes Amos, Dycie Campbell, Judy Carter, Aurelia Fraley, Evelyn Griffin, Thelma Hurley, Margaret James, Dorothy Keach, Faye McKinney, Virginia Rogers, and Marty Shirley, Project Teachers, Clarke County Public Schools; Elizabeth Acheson, Frank Golley, E. Paul Torrance, and William Zeitler, University of Georgia, Project Consultants.

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Cover design by Sherri Hardeman, a primary level pupil at Oconee Street Elementary School, Athens, Georgia.

REQUIRED MATERIALS

Throughout this module a variety of materials and/or arrangements will be required. Some of these may take some time to secure. Provided below is a sequential listing of the needed materials.

1. Large bulletin board, different colors of construction paper or colored pipe cleaners, scissors, staplers, record player, record "Waltz of the Flowers" from Rschaikovsky's Nutcracker Suite

2. Display made in previous lesson, pictures of people being affected by air pollution, pictures of factories, auto traffic, apartment houses, etc., large picture of lungs (one lung pink, the other one dark brown or black)

3. Crayons, maps of the Southeastern states (can be obtained by writing to local offices of the American Automobile Association, Shell, etc.), brochures and pictures of cities (Write to the Chamber of Commerce of each city listed on page 7.)

4. Encyclopedia, chart paper, brochures and pictures of cities obtained for preceding lesson

5. Dirty rugs or mats (at least three), corn broom, vacuum, stick, retrieval chart

6. None

7. Arrangements for class visit to an automobile service station, note pads, pencils

8. Pictures of cars from magazines or automobile agencies, light color construction paper, large chart paper, rulers, scissors, compasses

9. Circle graphs made in preceding lesson, crayons, automobile picture, paper and pencils

10. Construction paper, paste, pipe cleaners, scissors, staplers, thread, pieces of stiff wire (supports for mobiles)

11. Arrange for guest speakers to present pro and con of public transportation (see page 33)

12. Paper, pencils, poster board, crayons, paints, tape recorder, two or three blank tapes

Level Three: Eight Year Olds
Theme C: Man and the Air
MODULE GENERALIZATION: Man can reduce the danger of pollution of his air resources by several methods.

Content: Air pollution can be harmful to health. Part A.
Materials: Large bulletin board, different colors of construction paper or colored pipe cleaners, scissors, staplers, record player, record of Nutcracker Suite, Tschaiskovsky's "Waltz of the Flowers."

Learning Experience

Prepare the bulletin board with a base of green, blue for sky, a sun, and a little cloud. Briefly discuss with the class some of the beautiful days we have had -- sunny, clear, blue skies, etc. Ask some reasons why they like it that way. Get them to talk about some of the things they like to do on days like that. Brainstorm as many as they can think of. Explain that you are going to put together a scene of a beautiful day. They are to cut out stick figures doing some of the things they said they like to do (running, jumping, riding bikes, etc.). When they have had a chance to complete their stick figures, tell them that as they put them on the scene you are going to play a record. Tell them the name of the record and write it on the board together with the name of the composer. Explain that he was a man who also appreciated beautiful days. When the bulletin board has been completed, tell them to pretend they are the stick figures come to life. Have some volunteers arrange themselves like the figures on the bulletin board and move in time to the music. Give as many as wish the opportunity to "bring the bulletin board to life."

Behavioral Objectives	Focusing Questions
Children will:	
State reasons why they enjoy clear, sunny days.	Why do we usually like to have clear, sunny days?

Behavioral Objectives	Focusing Questions
Listen to the music, "Waltz of the Flowers," as they place their figures on the bulletin board.	As you place your figures on the scene, listen to the music that will be playing. It was written by someone else who appreciated the beauty of nature. His name was Tschaikovsky and the music is named "Waltz of the Flowers."
Pretend they are the stick figures and move in time to the music.	Let's pretend that our bulletin board comes to life when the music is played. How could the figures move in time to the music?

Supplementary Learning Experiences

1. Have the children make up short poems (about four lines each) about some activities portrayed on the bulletin board or about their feelings concerning sunny, clear weather.

2. Ask for volunteers to find out more information about Tschaikovsky for a report to the class.

3. Tell the class what air really is - a colorless odorless mixture of gases - 78% nitrogen, 21% oxygen, 0.3% carbon dioxide, and about 0.7% rare gases.

4. Add words to the dictionary begun in the land module.

Content: Air pollution can be harmful to health. Part B.
Materials: Bulletin board display, pictures of people affected by air pollution, pictures of factories, auto traffic, etc., large picture of lungs, one lung pink, the other one dark brown or black.

Learning Experience

The purpose of this lesson is to show the various levels of pollution that exist and some of the possible causes. Near to the outdoor scene created in the previous lesson, add pictures of some factories. Use brown or black pastel chalks and shade lightly over some of the picture. Have them observe the changes in the scene and discuss what might have caused the changes.

Then add more pictures of factories, apartment houses, automobile traffic, etc. and show more pollution on their scene. You could darken cotton with chalk and dust, pull it out very thin and put it on the mural. You could also use a piece of black netting spread over the picture to create the effect of pollution. Again, discuss the changes that have taken place and the reasons for those changes.

After they have discussed what pollution did to nature, tell them they are now going to look at what it does to people. Display one at a time the pictures of people crying, coughing, sneezing, etc. Give them time to discuss each one, giving reasons why breathing in unclean air might do that to you. Have them relate any similar experiences they have had. If they don't already know that we use our lungs to breathe, then tell them. Show them the picture of the lungs and ask which is the one that shows someone has been breathing in polluted air. When they have decided, display pictures and lungs under titles.

POLLUTED AIR CLEAN AIR

Behavioral Objectives	Focusing Questions
Children will:	
Note changes in their outdoor scene.	What are some changes that you notice about our lovely outdoor scene?
Hypothesize about the causes of change.	What do you think may have brought about these changes?
Propose reasons why these caused changes in the outdoor scene.	Why would automobile traffic, factories, etc., change our scene so much?
Observe and describe pictures of people affected by pollution.	Let's take a look at some people who breathe in this polluted air and see some of the effects it has on them. What do you notice about this picture? (Show each one.)
State reasons why polluted air might cause these conditions.	Why do you think the polluted air might cause this to happen?
Relate similar experiences.	Has anything like this ever happened to you or to someone you know? We have looked at some effects of air pollution that we can see. Now let's look at a picture of something we can't see. Here are two lungs. One has been breathing clean air and the other has been breathing polluted air.
Note differences between the pictures of the lungs.	What are some of the differences between these two lungs?
Hypothesize about which is the one that has been breathing in the polluted air.	Which of these lungs do you think has been breathing polluted air?

Behavioral Objectives	Focusing Questions
State reasons for their responses.	Why do you think it is that one?
Consider effects of air pollution on other living things.	What other living things besides people would be affected by air pollution?

Supplementary Learning Experiences

1. Arrange for the class to see the film Breathing Easy (color, sound, 27½ minutes, 16 mm). It can be obtained free on request from Georgia Tuberculosis and Respiratory Disease Association, 1383 Spring St., N. W., Atlanta, Georgia, 30309. A youngster takes a trip into the brain to find out how the human respiratory system works in health and in air pollution. A booklet accompanies the film - As You Live ... You Breathe. Send for individual copies for the class.

2. Invite a representative of the local chapter of the Georgia Tuberculosis and Respiratory Disease Association, 110 W. Hancock St., Athens, Georgia, 30601, telephone 549-5643 to come and speak to the class about the dangers of air pollution to health.

3. Begin with a simple pastoral scene. Have the children work in groups to "develop" the area. They could cut out of construction paper, people, apartment houses, railroad tracks, highways, etc. and tack them right on the scene. As they "develop" the area, ask them what changes would occur in the air.

4. Read to the class The Air We Live In, What We Must Do About It by James Marshall (Coward - McCann, New York, 1970). It tells where pollutants come from and what diseases are caused by dirty air.

Content: Large cities tend to be more polluted than small cities. Part A
Materials: Crayons, maps of Southeastern states, brochures and pictures of cities.

Learning Experience

Explain to the class that you are now going to study about a few cities to find out why some places are seriously polluted and others are not. Write on the board: (You might also have each child make a copy of his own).

SERIOUSLY POLLUTED	NOT SERIOUSLY POLLUTED
Mobile, Alabama	Raleigh, North Carolina
Atlanta, Georgia	Augusta, Georgia
Birmingham, Alabama	Athens, Georgia
Chattanooga, Tenn.	Charleston, S. C.

Display pictures of each city next to the name. Hang up two of the maps (one of each side) so that both sides can be seen by all the class. Distribute the maps of the Southeastern states. Give the children a few minutes to examine them. Bring their attention to the fact that there are many states on this map. Point out the variety of information given.

Have all the children turn to the index of cities. Take one city at a time. Tell them to find the state first and then find where the city is listed. (Explain that the states and cities are in order according to the alphabet). When they have found the place, have them copy the key letter and number. Have a child put it on the board also. Continue this until you have the location keys for all the cities. Now point out for the class the position of the letters and numbers on the map and explain that they are the keys to the location of each place. Find the first two cities with them and then allow them to find the others. Have them draw a circle in black crayon around polluted cities and a circle in blue crayon around others.

Learning Experience

Note: This activity can be carried out by individuals or groups. Where reading problems exist, it might be better to group the children so that there would be at least one reader in each group.

Behavioral Objectives	Focusing Questions
Children will:	
	We sometimes wonder why some places have polluted air and other have not. There are many reasons for this and we shall look at a couple of them. Here are two lists of cities. Some have serious air pollution problems. The others do not. Let's try to find out something about these places that will help us understand why.
Observe pictures of each of the cities.	What are some things the pictures tell us about these cities?
Examine the maps of the Southeastern states.	These are maps of the Southeastern part of the United States - where we live. Take a few minutes to look them over and talk about them with your group.
Locate cities on the map using the given location keys.	In the section of the map called Index, we are given information to help us locate cities. Let's turn to Index. The states are listed in red and cities are in black below them. They are all in order according to the alphabet. Let's take one city at a time beginning with Mobile, Alabama. First, find the state. Now find the city under it. To the right of the city are a letter

Behavioral Objectives

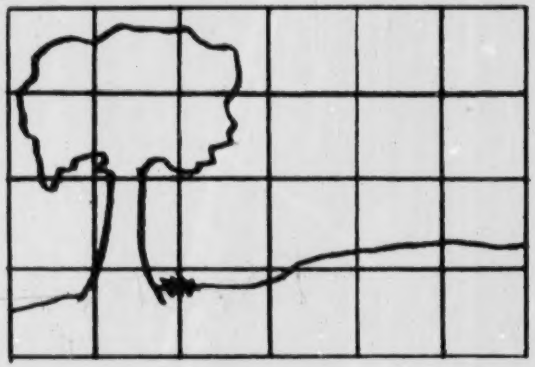
Focusing Questions

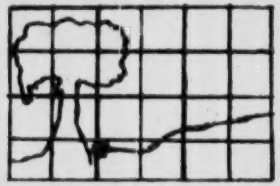
and a number that are your keys to location. Copy them down. (Continue until all the location keys have been found.)

Supplementary Learning Experiences

1. Make a grid game for the children to play using the location keys of the map. Display on the bulletin board a list of keys and with each key, a description of the place. Tell them to find out what the places are; e.g., J9 U. S. Naval Air Station located here (Pensacola).

2. Show the class how to use a grid system to enlarge or shrink pictures, etc.





3. Have the children collect and categorize newspaper articles about cities with or without serious air pollution problems.

Supplementary Learning Experiences

4. Tell the class the stories about the "killer smog" in Meuse Valley, Belgium, December, 1930; Donora, Pennsylvania, October, 1948; Poza Rica, Mexico, November, 1950; London, England, December, 1952. Information concerning it can be found in the booklet Air Pollution and Health. See Bibliography in Teacher's Manual.

Content: Large cities tend to be more polluted than small cities. Part B.
Materials: Encyclopedia, chart paper.

Learning Experience

Divide the class into about eight groups for data collection. Since they will need to use the encyclopedia, be sure to put those who can read with those who find reading difficult. Display large data chart for the whole class to see.

City	Area	Population	Major Industry
Birmingham, Alabama Atlanta, Georgia Mobile, Alabama Chattanooga, Tenn.			
Athens, Georgia Charleston, S. C. Raleigh, N. C. Augusta, Georgia			

Discuss with them first the data they want to collect. Assign two cities to each group of children (one from each category). There will be overlapping, but it will give more opportunity for precision. Those who finish ahead of time could look up other cities as well. When the children have had a chance to complete their research, have them place the data on the large class chart. Focus the children on the data and ask for any observations they may have just from looking at the numbers. Have them look at similarities and differences among cities that have serious air pollution problems and among cities that have not. Have them compare by subtraction, land area and population. Then focus on similarities and differences between the two groups of cities. Ask for as many conclusions as possible about the relationship of population and industry to air pollution problems.

Behavioral Objectives	Focusing Questions
Children will:	
Work in groups using encyclopedias to collect data on the population, area, major industries of cities with serious air pollution and cities without serious air pollution problems.	Let's look up some information that may help us to understand why some cities are seriously polluted and others are not.
	There are three things we want to know about each place - how large is the land area? How many people live there? What business does the city engage in?
Pool on a class chart the data they have collected.	Let's put the information on our class chart so that we can all study it.
Examine data for similarities and differences among cities with serious air pollution problems (area, population, industry).	Let's look at the data about the population of cities with serious air pollution problems. What differences do you notice about their populations? (Have them express differences by subtraction.) In what ways are the populations alike? (Ask similar questions for area and industry.)
Examine data for similarities and differences among cities with no serious air pollution problems (area, population, industry).	Let's look now at the other cities that do not have serious air pollution problems. What differences do you notice about the populations of these cities? In what ways are these cities similar in population figures? (Ask similar questions for area and industry.)
Compare the two groups of cities as to population, area and industry.	Looking at the groups of cities, what population differences do you notice between those that have serious pollution

Behavioral Objectives	Focusing Questions
	problems and those that do not? What is the difference between the smallest population of the seriously polluted and the largest population of the other group? (Ask similar questions for area and industry.)
State conclusions about air pollution, population, and industry.	Keeping in mind all that we have said, what could you say about some of the causes of air pollution?

Supplementary Learning Experiences

1. Write or call the National Tuberculosis and Respiratory Disease Association, 1383 Spring St., N. W., Atlanta, Georgia, 30309 for individual copies of the following pamphlets: Don't You Dare Breathe That Air, It's Your Problem Air Pollution, Air Pollution Explained: The Pollutants, What You Can Do, Pollution and Your Health.

2. Have the class begin a comparison chart of the pollution levels of major cities of the world on particular dates.

3. Add to the class library Clean the Air! Fighting Smoke, Smog, and Smaze Across the Country by Alfred Lewis (McGraw-Hill, New York, 1965).

Content: Inefficient methods are part of the causes of air pollution.
Materials: Dirty rugs or mats, corn broom, vacuum, stick, retrieval chart.

Learning Experience

Briefly review with the class the previous lessons on the effects of air pollution on health and the relationship between population, industry, and air pollution. Tell them that now they are going to take a look at some other things related to air pollution.

Have the children notice that the rugs are quite dirty and need to be cleaned. Tell them they are going to see some of the ways to do the cleaning and they are to watch each process carefully so they can talk about it later. Direct their attention to the retrieval chart where you will list their reactions as they clean each rug by a different method.

WAYS TO CLEAN RUGS

	Effects on rug	Effects on us	Effects on air
Beat			
Sweep			
Vacuum			

The first and oldest method is beating the rug. You may have to do this outside in the yard. If there is no line to hang it from, have two children hold the rug while another one beats it clean.

For a second rug, have the children use the corn broom vigorously so that a lot of dust is raised.

Clean the third rug with the vacuum.

Now have the children study the chart and compare the three methods of cleaning. The children will probably respond that the vacuum cleans best and raises the least dust. Focus on this point asking them for reasons why this might be true.

Learning Experience

Tell the children to discuss at home what they did in class with the rugs. Ask them to recall any other situation where there might be several ways to do something where one way would cause less air pollution than another. They will have a chance to share these ideas in class.

Behavioral Objectives	Focusing Questions
Children will:	
Examine rugs that need cleaning.	We have several rugs that need to be cleaned. We are going to clean each one in a different way. What other ways are there to clean rugs?
Clean the first rug by beating it.	People used to clean their rugs this way and some probably still do.
Note the effects of beating the rug (on them, on the air, on the rug).	What are some things that happened to you when we cleaned the rug this way What effect did it have on the air around it? What effect did it have on the rug?
Clean the second rug by sweeping vigorously with the corn broom.	Here is another way to clean a rug.
Note the effects of sweeping the rug (on them, on the air, on the rug).	What happened when you cleaned it this way? What happened to you? What happened to the rug? What effect did sweeping the rug have on the air around us?
Clean the third rug with a vacuum.	There is still another way to clean the rug.

Behavioral Objectives	Focusing Questions
Note the effects of vacuuming the rug (on them, on the air, on the rug.)	What effects did vacuuming have on you? What effects did it have on the rug? What were some of the effects on the air around the rug?
Identify similarities among cleaning methods.	In what ways are the cleaning methods alike?
State reasons for their responses.	Why do you think so?
Identify differences among the cleaning methods.	In what ways are the cleaning methods different?
State reasons for their responses.	What is it that makes you think that?
Compare data about effects on the air.	What differences have cleaning methods made to the air?
Consider the effects of air pollution on plant and animal life.	If the air is affected, what else would be affected also?

Supplementary Learning Experiences

1. Extend the idea of plants and animals being adversely affected by air pollution. Have the children consider in what ways they would be affected.

2. Write to United States Environmental Protection Agency, Washington D. C., 20460 for individual copies of pamphlets: Man and His Endangered World and Needed: Clean Air.

3. Use the class-formed dictionary and arrange a matching game of environmental terms and definitions on index cards.

Content: Inefficient methods are part of the causes of air pollution.
Materials: None.

Learning Experience

Review the previous lesson. Pair the children and give them a few minutes to tell their partners secretly what they thought of for a similar situation about the rug cleaning activity. Tell them to decide on one, and be ready to act it out for the class where one partner is BEFORE and the other partner is AFTER. The rules are:

1. They have one minute each to act out the situation.
2. They may use anything but words.
3. The class has 30 seconds to guess and if they can't guess, the pair will tell them.

Note: Some situations they may propose are:

Before	After
Open burning at the city dump	Land fills
Open burning of leaves	Bagging leaves, making compost piles
Charcoal fires	Closed grills
Duster, dusting cloth	"En Dust" on paper towel
Packing garbage in bags	Tightly closed garbage cans
Heating homes by coal or oil	Gas heat

Behavioral Objectives

Children will:

Work in pairs to act out situations demonstrating different ways to reduce air pollution.

Focusing Questions

You talked at home about our rug cleaning activity and you were going to think of some other situations where the way we do something could make a difference in air pollution. Tell your partner secretly what your idea is of a similar situation. You are going to have one minute each to act it out for the class.

Behavioral Objectives	Focusing Questions
	One of you will act out BEFORE and the other one will act out AFTER. You may not use any words. The class will have just 30 seconds to guess what it is and if they don't guess, you will tell them.
State conclusions about the relationship between the methods we use and air pollution.	Considering all the methods we have acted out and talked about, what could you say about air pollution and the way we do things?

Content: Automobiles pollute the air.
Materials: Local service station, note pads and pencils.

Learning Experience

Contact a local service station and make arrangements for the class to visit. Ask them ahead of time if they will show some parts of a car that are clean and new and some that are dirty or faulty. Ask them to explain how this is related to air pollution. Explain to the children that they should feel free to ask questions about automobiles and air pollution. Instruct them to take notes so they will be able to talk about the study trip when they get back to class. When the class returns, group them for discussion.

After they have had a chance to talk about the ways cars cause air pollution, give them time to consider that taking care of cars regularly reduces pollution.

Behavioral Objectives	Focusing Questions
Children will:	
List some of the causes of air pollution that they learned about at the service station.	Thinking back over our visit to the service station, what are some of the causes of air pollution?
Suggest ways that people could avoid some of the causes of air pollution.	From what we learned today and from anything else you can think of, what are some things people could do to reduce air pollution?
State conclusions about automobiles as a cause of air pollution.	What could you say generally about automobiles as a cause of air pollution?

Supplementary Learning Experiences

1. Tell the children to check their local service station to find out the different kinds of gas available and the prices of each (lead-free, no-nox, etc.). Discuss with them why some cost more than others.

2. Compare the prices among the various brands of gasoline. Use subtraction to decide the price differences.

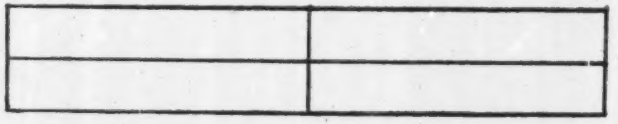
3. Discuss what is meant by a gasoline shortage. Have the children check newspaper or magazine articles explaining the causes and some of the measures being taken to limit the use of gasoline.

4. Ask the children if they have ever heard the expression "a tune-up." Explain what it means and how it is related to air pollution.

Content: People use automobiles of different sizes.
Materials: Pictures of cars, light color construction paper, large chart paper, rulers, scissors, compasses.

Learning Experience

Distribute the construction paper to the class. Have a large piece that you will work on displayed where they can all see it. Explain that they are going to find the center of the paper by using the ruler. Show them how to measure on the length and width with the ruler to find the half-mark, then drawing lines that will intersect at the center. Have them divide their paper in the same way.



Explain that they are now going to use the compasses to make the largest circle they can make on that paper. Show them how to place the point on the center and adjust the compass so the diameter is as wide as it can be on the paper. When they have the circle completed, it has four equal parts. Show them how to draw diagonal lines which will divide the circle into eight equal parts. Then have them cut the circles out of the paper. Show the children the pictures of each type of automobile. Place the pictures under the headings -

4 cylinder
6 cylinder
8 cylinder

Tell them they are going to find out what types people in their local neighborhood have. They will each ask eight persons whether they have a 4, 6, or 8 cylinder car. They will also ask them why they have that kind. Tell them to keep a record of the answers and bring it to class the next day. While they look at their circles, explain that these are graphs, (pictures of information) and that each space stands for one of their answers. To be certain that each one knows what is required, let them practice a few interviews by role-playing. Encourage them to explain to people first what they are doing and why.

Behavioral Objectives	Focusing Questions
Children will:	
Measure the length and width of the paper to find the mid-point.	Find the half-way points of the length and width of your sheet of paper just as I did on the large sheet of paper.
Use the rulers to draw from those mid-points lines which intersect at the center of the paper.	Now use your rulers to connect the two width points with each other and the two length points with each other.
Use compasses to draw circles from the center.	Place the point of your compass in the center and make the biggest circle on the sheet of paper that you can.
Draw diagonal lines that will divide the circle into eight equal parts.	Now divide each fourth in half.
Observe pictures of automobiles.	Here we have a few pictures of automobiles.
Identify similarities among the automobiles.	In what ways are they alike?
Identify differences among automobiles.	What do you see that's different about them? Their motors are different sizes. They are 4 cylinder, 6 cylinder, and 8 cylinder.
Collect information from eight persons about the size of car they have.	We want to get an idea of what kinds of cars people around here own. You are to ask eight persons whether they have a 4, 6, or 8 cylinder and why they have it. Keep a record of their answers and bring it to class tomorrow.

Behavioral Objectives	Focusing Questions
Practice how to conduct an interview by role-playing.	Let's act out a few situations so we'll all know just how to do it. If someone from this class rang your bell tonight to ask a few questions, what do you think their conversation would sound like?

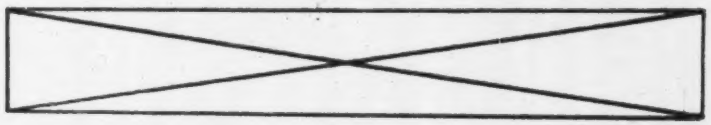
Supplementary Learning Experiences

1. Make a collection of automobile advertisements that mention the number of cylinders.

2. Have the children make a scrapbook of the various automobile manufacturers and put in it pictures of their different cylinder cars; e.g., Chrysler Motors
   8 cylinder - Newport, Imperial, Valiant
   6 cylinder - Plymouth, Duster, Valiant.

3. Talk about which cylinder cars cause the least air pollution.

4. Show children another way to find the center by drawing diagonal lines that intersect.



   Have them work with different kinds of figures to achieve a variety of geometric designs.

Content: People use automobiles of different sizes.
Materials: Circle graphs, crayons, automobile pictures, construction paper, paper and pencils.

Learning Experience

The children should have the circle graphs made in the previous lesson and the information they collected. Review with them the different types of cars and the meaning of the eight spaces on the circle graph. Have them count the total 4 cylinder cars they have and color in (in one color) that many spaces on their graph, labeling the spaces 4 cylinder. Then do the same for the 6 cylinder and 8 cylinder cars (with a different color for each) until the graph is completely filled in. Have them show each other their graphs and have several show them to the class (as many as you have time for). Display these in the room. Now tell them that they are going to put all their information together to develop a class graph which could be displayed in the school hall where others could see their work. Assign five or six children to a group and direct them to compile by addition the number of cars of each type in their group. Have them put the addition on the board so all the children can see it and check it. Then take the totals for each group and have them add them for a class total. Now explain how this is to be pictured on the graph. Have the class multiply the number of children who collected data (30) by the number of people who were questioned (8). They are then talking about $30 \times 8 = 240$ cars in all. So the class graph represents 240 cars. But we can't divide the graph into 240 sections so we'll have to use a system of fractions to show the number of cars in each type; e.g.,

4 cyl.	80 cars	$\frac{80}{240} = \frac{1}{3}$
6 cyl.	60 cars	$\frac{60}{240} = \frac{1}{4}$
8 cyl.	130 cars	$\frac{130}{240} = \frac{5}{12}$

Learning Experience

As you write the fraction, say at the same time "80 out of 240 are 8 cylinder, 60 out of 240 are 6 cylinder," etc. The children may not understand fractions, but at least they will know what they mean by their numbers.

Since the totals you will be working with will be uneven, you should approximate for graphing. You should divide the graph into sections for purposes of accuracy. But allow the children to color them in and label the sections. Then using the graph, ask questions concerning how many of each type, etc.

Behavioral Objectives	Focusing Questions
Children will:	
Graph the information they collected about the automobile sizes.	Your circles have eight spaces on them. Each of those is for someone you asked. How many spaces will you color in for 4 cylinders? 6 cylinders? 8 cylinders?
Explain their graphs to each other.	Take a few minutes to turn to those near you and compare your graph with theirs. Do you have more or fewer small cars? Now we are going to put together all our information for a class graph that we can put on display for the school to see.
Work in groups to add the numbers of 4 cylinder, 6 cylinder, and 8 cylinder automobiles.	In your groups, find the total number of 4 cylinder cars. 6 cylinder cars. 8 cylinder cars.
Add the group totals to get class totals.	Let's put all the group totals together now to get a class total for each type of car.

Behavioral Objectives	Focusing Questions
Multiply the number of children who collected data by the number of people they questioned.	Let's check our work now in a different way. How could we find out by multiplication if our total is really correct? (If they don't know, explain how to do it.)
Express in fractions the numbers of each type of car to the total.	Since we can't divide our graph into that many parts, we shall use fractions to show the parts. What part of (240) is 80 cars? $\frac{80}{240}$, etc.
	Note: How much of this the children actually do depends on their previous work with fractions. However, even if they cannot do the math, at least they will have an idea of how you arrived at the division of the graph.
Shade in graph sections representing different types of cars.	
Discuss the implications of the graph.	Looking at the way our graph is divided, which of the cars is in the greatest number?
Relate reasons people gave for the types of cars they had.	What were some of the reasons people gave for having that kind of car? Why do other people have a (larger or smaller car than that)?
State conclusions about the reasons for people choosing certain cars.	What do you think are the most important reasons why people choose 4 cylinder, 6 cylinder, or 8 cylinder cars?

Supplementary Learning Experiences

1. Extend the idea of the fraction by asking the children how many are in their class. Then ask how many are boys? how many are girls? Write on the board - boys - 15 out of 35 $\frac{15}{35}$ girls - 20 out of 35 $\frac{20}{35}$. Have them propose other data they can express as fractions.

2. Have the children check with the Motor Vehicle Bureau to find out how many automobiles are licensed in the county. Refer back to the population statistics in the water module and divide to find the proportion of cars to people in Clarke County.

3. Discuss with the children how driving safely could also reduce air pollution; e.g., keeping speed down, pulling away gradually from a red light or stop sign.

Content: There are many ways to travel within a city besides the automobile.
Materials: Construction paper, paste, pipe cleaners, scissors, staplers, thread, pieces of stiff wire (supports for mobiles).

Learning Experience

Briefly review with the class the number of automobiles and the pollution caused by them. Have them hypothesize about a situation where they would not have enough gas. Have them think of things they could do to use little or no gas to get to a different place. They will probably mention the use of bicycles, motorcyles, walking, etc. Try to get them to consider car pools as a way of conserving gasoline and thereby reducing air pollution. After the discussion, explain that they are going to construct mobiles of the different ways to travel. Allow them to choose the materials they would prefer to work with.

Behavioral Objectives	Focusing Questions
State hypotheses concerning the ways people would travel to different places in the city if there were a gasoline shortage.	Suppose we were told that there was to be a serious shortage of gasoline. How could we travel from one part of the city to another using as little gas as possible?
List alternative ways to travel from one place to another.	What are some other ways besides the automobile that we could use to travel in the city?
Construct mobiles which show different means of travel.	Choose whatever kind of material you would like to work with to construct a mobile showing different ways to travel.

Supplementary Learning Experiences

1. Let the children act out a meeting of a family or neighbors who are trying to work together to save gasoline. Have them exchange some ideas and then let the class comment, ask questions, or make additional suggestions.

2. Ask the children how they would feel if they could not use an automobile. Ask how their mothers and fathers would feel. Let them act out what would happen at home if they heard the news that no one could use an automobile. (What might happen at school?)

3. Consider not being able to use automobiles. In what ways would this be harmful? (fire engines, police cars, etc.) In what ways might this be helpful? (less pollution, healthier, etc.)

Content: Public transportation is one way of solving the automobile problem. Part A.

Materials: Guest speakers to present pro and con of public transportation.

Learning Experience

Make arrangements for two speakers to come to the school to present the pro and con sides of the issue of public transportation. Here are a few suggestions: pro - Model Cities, Paul Oeland, Cynthia Worms, con - Robert Kimbrell, City Councilman, 2nd Ward, First National Bank. When arrangements have been made, be certain that the guests understand clearly what is expected of them.

In order to prepare for this event, discuss with the class the content of the previous lessons. Focus particularly on other ways to travel in order to reduce air pollution problems. Tell the children that guest speakers are coming and have them suggest arrangements. (They may want to have different seating arrangements, invite the principal, make programs, etc.) Divide the class into committees on the basis of their suggestions so that all the children will be personally involved; e.g., 1. Program Committee, 2. Arrangements Committee, 3. Reception Committee. Explain to them that speakers generally leave some time for people to ask questions about what they have said. Tell them to be sure to ask about anything they don't understand.

Behavioral Objectives	Focusing Questions
Children will:	
Suggest arrangements necessary to prepare for guest speakers.	What arrangements do you think we shall have to make for our guest speakers?
Give reasons for their suggestions.	Why would we have to do that?
Work in committees on the arrangements for the guest speakers.	As a group, decide what you will do in preparation for our guest speakers.

Behavioral Objectives	Focusing Questions
	For what, specifically, will your group be responsible? How will you go about completing your task?

Supplementary Learning Experiences

1. If there is a class or school paper, have the children submit an announcement of the guest speakers.

2. Have the children write up a short news article about the guest appearance mentioning the highlights of what was said both pro and con public transportation.

3. Perhaps some of the children who have cameras could take pictures of the guests with different groups of the class. These could be placed on the bulletin board with news reports of the occasion.

Content: Public transportation is one way of solving the automobile problem. Part B.

Materials: Papers and pencils, poster board, crayons, paints, tape recorder, two or three blank tapes.

Learning Experience

After reviewing the ideas presented by the guest speakers for and against public transportation, explain to the children that they are going to have an election based on that issue. Divide the class into two parties, one for, and the other against. Tell them they are to decide by a primary election who their candidate will be. Explain that anyone who is eligible may run, but that the nominee with the greatest number of votes will become the party candidate. Explain and demonstrate the process of nominating and seconding. Then give the group some time to get a list of nominees. Now discuss with the class the meaning of campaigning. Let each one who has been nominated have equal time to speak for himself or have others speak for him about why the party should choose him as the candidate. Tape record all speeches for later use. When the campaigning has been finished, proceed with the party elections. Have the groups distribute secret ballots and choose ballot counters. By this process, each party should arrive at one candidate who will run on a platform either for or against public transportation particularly as it is related to air pollution. Now tell the class that the voting will be held in other classes as well (perhaps the other classes of your grade). The children in those other classes know nothing about the issue so they will have to provide publicity to influence those voters. Cive them time to meet and to decide on what they will do. Then give them a few days to carry out the activities and plan the conducting of the elections in the other classes. Some examples of activities they might do:

1. Campaign speeches to all classes.
2. Posters on the issue of public transportation as related to air pollution.
3. Meeting in small groups with children of other classes to discuss the issue.

Learning Experience

4. Making handouts or flyers.
5. Tape recorded messages to be played in classes.
6. Campaign songs.
7. Campaign slogans.
8. Making buttons or signs.
9. Dramatizing the issue of public transportation.

Behavioral Objectives	Focusing Questions
Children will:	
Form two political parties with opposing views on public transportation.	We are going to divide our class into two political parties. One party will favor public transportation and the other party will oppose it.
Conduct primary elections to decide on a party candidate.	Each party must now decide on one candidate they will put up for election. The party members will elect a candidate. This is called primary elections or first elections. Party nominees generally give brief campaign speeches.
Select party candidates by use of secret ballots.	Now that you have had a chance to see and hear the nominees, you will write on a secret ballot the name of the one you choose as the candidate.
Plan a publicity campaign to be held in other classes before the voting.	Each party must decide how you can influence people to vote for you. What are some things you can do to get publicity? (Explain the word "publicity" if they do not know its meaning.)

Behavioral Objectives	Focusing Questions
Conduct the elections in their own class and in the other classes of the grade.	Now it is time for the actual casting of ballots so we can see which candidate the voting public has decided on.
Listen to the tape recorded campaign speeches of the election winner and discuss the importance of the election to air pollution.	_____has won the election. Now let's listen to the things he promised in his campaign speeches. If he carries out his promises, what effects will his election have on air pollution problems?

Supplementary Learning Experiences

1. Since public transportation was just recently an issue in Athens, Georgia, have the class collect newspaper articles concerning it.

2. From the Board of Elections find out how many people are registered voters and how many people voted on that issue. Compare this with the number of people who voted in the last mayoral election. Discuss reasons why such a small percentage of people voted.

3. Ask for some things that could be done to get more people out to vote on important issues like something concerning air pollution.

4. Add to the class library Clean Air - Sparkling Water: The Fight Against Pollution, by Dorothy Shuttlesworth (New York, Doubleday and Company, 1968).

5. Obtain a copy of Man In His Environment, produced by Coca Cola, U. S. A. This is a classroom ecology kit designed to help children understand some major ecological principles.